



SIERRA LEONE.

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# Annual Report

OF THE

## Department of Agriculture

### For the Year 1935.

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1936

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## DEPARTMENT OF AGRICULTURE.

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### REPORT FOR 1935.

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I have the honour to submit my report for the year ending 31st December, 1935.

#### SECTION I.

2. The year under review was remarkable for a general lateness of the rainy season, and crops were consequently late. The rice and ginger crops were about a month behind the normal time and citrus crops were six weeks late. As a result of the late rice crop there was a comparatively high price for rice in September for the old crop when normally supplies of new rice should have been coming into the market. The dry season 1934-35 was particularly dry with the result that many plants and root crops were hard hit. Much ginger was shrivelled in the ground and the 1934-35 crop was a poor one with regard to quality. Moreover, the severe dry season dried up the ginger to such an extent that there was a scarcity of good "seed" for 1935,

3. *Rice*.—The rice crop of 1934-5 (harvesting of wet rice does not end till February) was a good one, probably the heaviest yet known, and although the following upland harvest (began October) was a month late, there was plenty of rice in the country. In addition, over a thousand tons of rice were exported which is a record for Sierra Leone. It is less easy to estimate the 1935-6 crop, for although reports indicate an average harvest the rice is very slow in coming on to the open market. Since there will be only eleven months to cater for, assuming 1936 to be an average year as regards seasons, it would appear that there should be an adequate supply of rice for 1936. It is, however, always difficult to estimate the amount of rice which the farmer will sell and how much he will consume. It depends to a large extent on the comparative price of other products, notably palm kernels. With an improvement in the price of kernels the farmers tend to stick on to their rice. Moreover, there is a further point to be considered. With the development of the mining industry there has been a diversion of over 11,000 labourers and their dependents to a large extent from farming to mining during the last few years, and although this may not seem much yet is appreciable in a working community of about 350,000 active labourers (it is thought that allowing for women and children only 1 to 5 of the population of Sierra Leone can be regarded as able-bodied labourers). The diversion of this number of people to mining means that a correspondingly larger amount of food has to be produced by the rest of the population.

4. There is without doubt an increasing use made of the inland swamps of the country and the annual hungry season has disappeared. There may of course be local shortages of rice but annual hungry seasons, bordering on starvation conditions, which were common ten to fifteen years ago, now no longer recur.

5. The imports and exports of the last seven years are given below and indicate a considerable improvement in the internal production of rice :—

| —    | Imports,<br>White Rice,<br>Tons. | Exports,<br>Native Rice,<br>Tons. | Excess (+) or<br>Deficit (—) of Exports<br>over Imports, Tons. |
|------|----------------------------------|-----------------------------------|----------------------------------------------------------------|
| 1929 | .. 3,029                         | 13                                | — 3,016                                                        |
| 1930 | .. 2,618                         | 175                               | — 2,443                                                        |
| 1931 | .. 457                           | 177                               | + 280                                                          |
| 1932 | .. 301                           | 559                               | + 258                                                          |
| 1933 | .. 125                           | 158                               | + 33                                                           |
| 1934 | .. 81                            | 221                               | + 140                                                          |
| 1935 | .. 29                            | 1,024                             | + 995                                                          |

6. *Palm Kernels*.—1935 was a record year for the export of kernels. The price steadily improved throughout the year commencing at £4 12s. 6d. a ton in Freetown and finishing up at £7 10s. 0d. a ton. This steady increase of price greatly stimulated production and the total exports were 78,019 tons.

7. The exports for fifteen years are given below :—

| —               | Tons exported. | £         |
|-----------------|----------------|-----------|
| Average 1920–29 | .. 58,150      | 1,024,798 |
| 1930            | .. 56,641      | 664,591   |
| 1931            | .. 54,462      | 449,742   |
| 1932            | .. 77,162      | 687,477   |
| 1933            | .. 64,084      | 472,824   |
| 1934            | .. 68,655      | 470,780   |
| 1935            | .. 78,019      | 583,645   |

8. It is interesting to note that fluctuations in the total exports of kernels are chiefly reflected in the quantities carried by the railway. The quantities from the river areas do not appear to vary to the same extent. The figures for the last four years are :—

| —    | Total<br>Exports,<br>Tons. | Total<br>Railments,<br>Tons. | Waterborne<br>Kernels,<br>Tons. |
|------|----------------------------|------------------------------|---------------------------------|
| 1932 | .. 77,162                  | 41,960                       | 35,202                          |
| 1933 | .. 64,084                  | 33,294                       | 30,790                          |
| 1934 | .. 68,655                  | 33,925                       | 34,730                          |
| 1935 | .. 78,019                  | 43,106                       | 34,913                          |

9. *Palm Oil*.—While the export of kernels has gone up by 10,000 tons compared with 1934, the increase in the amount of palm oil has been less than 1,000 tons. During the year 2,892 tons of palm oil were exported and the fact that there was not more palm oil exported as compared with the quantity of kernels is probably due to the fact that there is a local demand for palm oil (there is none for kernels) and that at the prices offered the producers were not very willing to part with it. The exports for the last fifteen years are :—

| —               | Tons exported. | £      |
|-----------------|----------------|--------|
| Average 1920–29 | .. 2,562       | 81,742 |
| 1930            | .. 3,652       | 79,310 |
| 1931            | .. 1,359       | 19,830 |
| 1932            | .. 2,208       | 26,914 |
| 1933            | .. 1,619       | 16,637 |
| 1934            | .. 2,225       | 18,032 |
| 1935            | .. 2,892       | 35,814 |

10. *Kola*.—The value of this crop improved slightly during 1935 but has not reached nearly to its former value. With the slightly improved value there was a corresponding increase of exports. These however are very much below the pre-slump period as is shown by the following figures :—

|         |         | Tons exported. | £       |
|---------|---------|----------------|---------|
| Average | 1920-29 | .. 2,932       | 279,678 |
|         | 1930    | .. 2,271       | 186,197 |
|         | 1931    | .. 1,584       | 47,847  |
|         | 1932    | .. 2,085       | 41,373  |
|         | 1933    | .. 1,812       | 43,656  |
|         | 1934    | .. 1,460       | 18,304  |
|         | 1935    | .. 1,859       | 39,415  |

11. *Ginger*.—The ginger crop of 1934-35 was below standard for quality. This was probably due to the very hard dry season. The ginger too was not well prepared and as a result special efforts were made to improve the 1935-36 crop by drafting instructors and inspectors into the ginger area towards the end of 1935. There was, however, a very welcome increase in price as shown in the figures given below :—

|         |         | Tons exported. | £      |
|---------|---------|----------------|--------|
| Average | 1920-29 | .. 1,582       | 56,778 |
|         | 1930    | .. 1,972       | 57,228 |
|         | 1931    | .. 1,927       | 32,518 |
|         | 1932    | .. 1,382       | 22,877 |
|         | 1933    | .. 1,545       | 16,543 |
|         | 1934    | .. 1,659       | 23,254 |
|         | 1935    | .. 1,506       | 36,918 |

12. *Piassava*.—The export of piassava for 1935 was slightly below the record established during the previous year, but the price improved slightly and this kept up the value of the exports. The quality of the Sherbro and Sulima piassava was well maintained :—

|         |         | Tons exported. | £      |
|---------|---------|----------------|--------|
| Average | 1920-29 | .. 1,645       | 22,707 |
|         | 1930    | .. 2,417       | 36,582 |
|         | 1931    | .. 3,150       | 31,846 |
|         | 1932    | .. 2,877       | 23,290 |
|         | 1933    | .. 3,499       | 30,108 |
|         | 1934    | .. 3,659       | 30,390 |
|         | 1935    | .. 3,438       | 30,997 |

13. *Cocoa*.—There has been a slight increase in the amount of cocoa exported which reached a record of 164 tons. There is still room for some further expansion of this crop, but really suitable areas for it are limited. The exports since 1929 are as follows :—

|  |      | Tons exported. | £     |
|--|------|----------------|-------|
|  | 1929 | .. 96          | 3,398 |
|  | 1930 | .. 80          | 2,548 |
|  | 1931 | .. 61          | 1,034 |
|  | 1932 | .. 81          | 1,295 |
|  | 1933 | .. 67          | 990   |
|  | 1934 | .. 138         | 1,755 |
|  | 1935 | .. 164         | 2,043 |

14. *Coffee*.—Interest is still taken in this crop and local needs are now more or less met. During 1935 there was an export of 11 tons valued at £299 which is the highest amount paid during the last nine years. There is still room for the further expansion of this crop.

15. *Cattle*.—There are as yet no statistics concerning the live-stock of the Colony. Cattle farming is carried out on a small scale in the Northern Province, sheep and goats are bred on a moderate scale and pigs to a small extent. Some 19 tons of hides were exported in 1935.

| Hides and Skins.    | Cwt. | £   |
|---------------------|------|-----|
| Untanned .. .. .    | 263  | 374 |
| Tanned .. .. .      | 124  | 770 |
| Other kinds .. .. . | 1    | 12  |

The figures since 1929 are as follows :—

|              | Cwt. | £     |
|--------------|------|-------|
| 1929 .. .. . | 876  | 4,654 |
| 1930 .. .. . | 840  | 2,853 |
| 1931 .. .. . | 620  | 1,687 |
| 1932 .. .. . | 540  | 1,223 |
| 1933 .. .. . | 580  | 987   |
| 1934 .. .. . | 440  | 692   |
| 1935 .. .. . | 388  | 1,156 |

16. *Beeswax*.—In 1934 propaganda was started for the production and export of beeswax. That year 15 cwt. only was exported but it was well reported on and the product obtained a 5% premium on existing prices. In 1935 some 37 cwt. were exported. This was put up in two grades and exported in cwt. bales. The wax had a ready market and sold for £5-£10 above existing prices.

## SECTION II—WORK OF THE DEPARTMENT OF AGRICULTURE.

17. Owing to shortage of staff the extension work of Agricultural Officers has been of necessity limited.

18. *Northern Province*.—Despite this shortage very useful work has been done in the Scarcies area of the Northern Province where the addition of an extra Agricultural Officer, made possible by a grant from the Colonial Development Fund, allowed considerable progress to be made. Preliminary tests with a rice imported from India (G.E.B. 24) has shown this rice suited to conditions in Sierra Leone. In 1934, as soon as the Scarcies Rice Station was opened, this variety was planted for multiplication for seed. As a result about 90 bushels were available for distribution to selected farmers in 1935. This was distributed and some 1,400 bushels bought back from the farmers under the rice distribution scheme financed by the Colonial Development Fund. This rice gave a good yield and subsequent milling tests showed that it yielded a clean even white grain. As the season progressed considerable interest was taken in this rice by farmers and many applications for seed in 1936 were received. The working of this scheme, as indicated by the results of 1935, looks most promising.

19. In connexion with the work for the development of rice growing in the Scarcies a mill has been erected at Cline Town (near Freetown) for the milling of rice. This was also made possible by the Colonial Development Fund. The mill buildings and the erection of the mill

were not completed by the end of the year but very good progress was made. The site of the mill is a good one and has easy access by water and road and is provided with a railway siding. Handling is thus reduced to a minimum. The mill is an up to date three-cone mill, erected by Messrs. Lewis C. Grant of Kircaldy, and is capable of dealing with about 25-30 cwt. of paddy per hour. Parboiling plant is also being installed and the mill will be able to mill both dry and parboiled rice.

20. In addition to work with rices suited to ordinary flood conditions, work was started with rices for deeply flooded areas and brackish areas. Seed of suitable kinds have been multiplied for trials in different areas in 1936. At Rokupr itself a storage barn is being erected for the storage of rice under the seed distribution scheme.

21. Agricultural substations were maintained at Makeni, Makump, Batkanu, Kabala and Port Loko. The substation at Kambia was closed down and the work of this station added to that of Rokupr. The object of these stations is threefold: to demonstrate better farming methods, to serve as a source of planting materials for distribution to farmers, and to provide training grounds for instructors.

22. The Makeni substation, which is the central upland station for the province, was enlarged. This station serves a particularly useful purpose. There are small demonstration plots of citrus, Deli oil-palm, Robusta coffee, Canary banana and Smooth Cayenne and Queen pine-apples. The following annual crops are grown for demonstration purposes and to afford a supply of planting material of the best varieties: Yams, cassava, Kono ground-nuts, ginger, beans and sweet potatoes. In the wet-land area, which can be irrigated when necessary, rice, including G.E.B. 24 and deep-water varieties, was grown. Rice was followed by green crops in the dry season. Coffee and Deli oil-palms were raised in the nursery. The activities on the other substations were similar although on a smaller scale. Poultry have been kept on a substation for the first time. A brown Leghorn cock and twelve hens of the same breed were obtained from Njala. They have done very well.

23. The chief assistance afforded by instructors to farmers was connected with the extension of wet-land rice cultivation; the maintenance of old and the establishment of new plantations of oil-palm and coffee; the wider cultivation and proper care of garden crops, particularly yams, bananas and fruit trees. The number of farmers receiving direct assistance was nearly one thousand.

24. Interest in Robusta coffee is being maintained, particularly in the Bombali District where several plantations are now in bearing. Keen applicants were afforded assistance, but this crop is not being unduly pushed until existing plantations have proved their worth. During the year some 60 new nurseries were established and 97 new plantations containing 9,317 seedlings were planted. 22 plantations, containing 867 trees of Deli oil-palm, were made for farmers. Of the plantations of Nigerian oil-palm established in previous years, over 40 are now bearing. 27 small plantations, containing 1,180 plants of *Canary banana* were made for farmers.

25. A report on the work of the Rokupr Rice Station is attached as Appendix I. This shows the very considerable progress made by this station in 1935 and there is little doubt that this station is already justifying its existence by the practical assistance afforded to rice farmers

in 1935. It will be possible to afford still more assistance in 1936 and in a very few years the whole character of the rice crop in the Scarcies will be affected by the work of this station.

26. The most important work in connexion with the pure-line selection of the best local rices, and the comparative trial of local and introduced varieties. The variety G.E.B. 24 has come up to expectations and other varieties of great promise are :—No. 79 a short-medium duration variety, from British Guiana, Co. 7, a long duration rice from Madras, and Kavunginpoothala, a deep-water rice, also from Madras. It appears probable too that the best pure-line selections of the local rices, Bolo, Bis, Fodea and possibly Toma, will prove valuable.

27. *Southern Province.*—Njala is the chief agricultural station and the investigations now being carried out there have absorbed the greater part of the time of the very limited European staff. At best the staff never exceeded two Agricultural Officers and for six months one of these Agricultural Officers had to supervise the work at Newton in the absence of the Agricultural Officer, Newton Fruit Farm, on leave. Little time therefore could be given to district work, but whenever possible one of the Agricultural Officers travelled in the Protectorate visiting and advising farmers.

28. Only one substation was maintained in the Southern Province and that was at Pandobu in the Kailahun District. Here new and improved varieties of food crops were grown for demonstration purposes and for the easy distribution of planting material. In this province also a great interest was shown in coffee. New nurseries and plantations were established in the eastern part of the province, the Moyamba District and around Njala. 97 nurseries were made during the year, 70 of these being in the Moyamba District and 22 new plantations were made containing just over 3,000 plants. With one exception, all plantations were made in the Moyamba District.

29. At the Njala Agricultural Station investigations were carried out dealing with the yields of the common varieties of cassava, methods of ginger cultivation, upland rice, sorghums, oil-palms, citrus, coffee and crops suitable for green manuring. Very interesting results were obtained from the ginger trials. From these it appears that the native method of close planting gives better returns (total yield in lb. weight) than wider spacings either on the flat or on ridges although the wider spacings gave larger hands. A further method, that of close planting on raised flat topped beds, gave better returns than the native method and also gave hands comparable in size with those obtained in ridges and with wide spacing. The use of those "lazy" beds, which are somewhat similar to the beds used by natives for sweet potatoes, may prove of great use in ginger cultivation and further trials will be made.

30. As a result of preliminary trials with 20 varieties of upland rice six of the best varieties (which are also the most popular among the farmers) have been selected for preliminary yield trials, while pure-line selection work will be started with the three most promising of these varieties. This work is similar to that being carried on in the Scarcies with swamp-rice and its importance in a country which annually produces about 175,000 tons of rice for local consumption cannot be overestimated.

31. Methods of maintaining the fertility of the soil with the aid of green manures were studied and trials made of the different green manures available.

32. Work with oil-palms was continued and we now have records over a period of years which allow us to select the trees which, over a number of years, have given high yields of good quality fruit of a uniform character. Breeding, using these trees as parents, was begun in 1935.

33. With regard to citrus, investigations were made with reference to the proportions of blemished fruits and the cause of the blemishes. Scab was found to be a serious cause and steps have now been taken to eliminate it. It so happens that scab was introduced into Njala some years ago and never eliminated from this plantation. The distribution of scab, however, is very limited in Sierra Leone and there appears no reason why it should not be eliminated. All scabbed trees in the Colony are now regularly inspected and treated. Any large trees that cannot be treated are being destroyed and scab free stock supplied free in replacement. This has resulted in the elimination of 80-90 % of the disease and it is hoped the disease will be entirely eliminated in the next two or three years.

34. Work continues with coffee, bananas, and with the trial introductions of various sorghums, beans, vegetables, etc., while a small plantation has been made of the black pepper which was introduced a few years ago. The pepper appears to be doing reasonably well and the planting of this crop will be greatly extended next year.

35. The poultry work at Njala has been most successful and flocks of pure bred Rhode Island Red,  $\frac{3}{4}$  bred birds and  $\frac{1}{2}$  bred birds have been reared. The  $\frac{1}{2}$  bred birds crossed by a pure bred cock gave a  $\frac{3}{4}$  bred of very attractive appearance. The  $\frac{3}{4}$  breeds are being crossed with a pure bred cock but it is early yet to say how the offspring will turn out. So far it appears that a small proportion of the native strain makes for hardier fowls. Great interest is taken in the poultry by the local farmers and the demand for the improved stock, both hatching eggs and birds, largely exceeds the supply.

36. *Colony Peninsula.*—In the Colony peninsula the work of the previous years was continued. In the eastern half, between Waterloo and Songo, the work was mainly connected with wet-land rice and there was an increase in the number of farmers assisted and in the amount of seed rice distributed. The success of this form of farming is the most pleasing feature of the work in the Colony peninsula.

37. A number of citrus trees of various kinds was distributed in the western part of the Colony and considerable interest was taken in grapefruit of which about 500 trees were distributed. Last year a number of citrus trees, chiefly grapefruit, was found to be infected with scab, and all grapefruit have been regularly inspected and treated, with the result that the disease is well on the way to being eliminated.

38. There was also a good demand for banana suckers and coffee plants and generally there has been an awakening of interest in the Colony peninsula.

39. An Agricultural Show was held by the Sierra Leone Agricultural and Commercial Society and this was a great improvement both in quantity and quality on that held in the previous year. Further, the Society, which is not subsidized by Government, showed a small credit balance from its Agricultural Shows—a very desirable state of affairs.

40. The work at Newton Fruit Farm was further curtailed by the cutting out of the citrus rootstock, variety and manurial trials. Owing to disease, etc., these plantations were not suitable for the trials for which they were originally intended.

41. Work on the cultivation of bananas on properly drained swamp land was continued and appeared very promising, the bunches being large and nearly all over 40 lb. weight—some of 80 lb. were obtained.

42. The experiments on pine-apples continue with promising results. The better types were increased with a view to sending trial shipments to England in 1936.

43. *Inspection of Produce.*—This continued as usual throughout the year and the quality of produce was on the whole well maintained. The absence of the Inspector of Plants and Produce on leave, and the impossibility of finding any Agricultural Officer as a relief from the very small staff of the department, threw much of the work of this branch of the department from May to October on the Director, who was too busy to spend the necessary time on trek to supervise the work of sub-inspectors in up-country stations. In spite of this, apart from one station, few complaints of inferior produce were received. It is hoped that the staff will be augmented to prevent a recurrence of this in the future. The report of the Inspector of Plants and Produce is attached as Appendix III.

### SECTION III—FINANCE.

44. The total provision made by Government for the carrying out of the work of the Agricultural Department (including the Entomological and Mycological sections) was £14,712. This was an increase of £68 on the provision for the preceding year. Of this amount £11,395 was for Personal Emoluments and £3,317 for Other Charges.

45. The total actual expenditure at the close of the year was £13,996 8s. 2d. made up as follows:—

|                                   | £       | s. | d. |
|-----------------------------------|---------|----|----|
| Salaries .. .. .                  | 10,653  | 2  | 5  |
| Duty allowance .. .. .            | 210     | 0  | 0  |
| Seniority pay .. .. .             | 270     | 19 | 4  |
| Total Personal Emoluments .. .. . | £11,134 | 1  | 9  |
| Other Charges .. .. .             | 2,862   | 6  | 5  |
| Total .. .. .                     | £13,996 | 8  | 2  |

46. The cost of each division of the department is as follows:—

|                                             |         |    |   |
|---------------------------------------------|---------|----|---|
| Headquarters .. .. .                        | 2,835   | 19 | 6 |
| Produce inspection .. .. .                  | 1,509   | 12 | 5 |
| Southern Province, including Njala .. .. .  | 3,666   | 6  | 6 |
| Northern Province, including Rokupr .. .. . | 2,587   | 9  | 2 |
| Colony Peninsula, including Newton .. .. .  | 1,222   | 15 | 3 |
| Research .. .. .                            | 2,174   | 5  | 4 |
|                                             | £13,996 | 8  | 2 |

47. *Rice Development*.—A free grant of £4,650 was made by the Colonial Development Fund during the year to develop the rice industry of the Colony. Of this amount it was estimated that £3,230 would be spent during the year for the purchase and erection of a three-cone rice mill, a store and buildings to house the mill, and to pay the salary of an Agricultural Officer specially engaged for rice breeding work. Owing to the fact that the mill was not delivered before the end of the year, only £1,271 14s. 2d. was disbursed by the close of the year and this was spent partly on the salary of the Agricultural Officer employed and partly in erecting buildings to house the mill.

48. *Revenue*.—The total revenue of the department amounted to £1,386 17s. 3d. as compared with £1,336 4s. 10d. in the previous year. There were slight increases in "Produce licences, Departmental fines" and "Sales—Newton Fruit Farm," when compared with 1934. "Fines for contravention of Native Produce Ordinance" and "Sales of produce" showed appreciable increases; but "Sales of old stores" dropped from £137 15s. 5d. in 1934 to £5 15s. 3d. in 1935. Particulars of revenue are as follows:—

|                                                                                    | £     | s. | d. | £      | s. | d. |
|------------------------------------------------------------------------------------|-------|----|----|--------|----|----|
| III—LICENCES:                                                                      |       |    |    |        |    |    |
| 20, Produce .. ..                                                                  | 1,106 | 14 | 0  |        |    |    |
| 29, Provincial Courts—fines<br>for contravention of Native<br>Produce Ordinance .. | 91    | 2  | 6  |        |    |    |
| 30, Departmental fines ..                                                          | 2     | 2  | 9  |        |    |    |
|                                                                                    |       |    |    | 1,199  | 19 | 3  |
| V—FEES OF COURT OR OFFICE:                                                         |       |    |    |        |    |    |
| 71, Receipts, Newton Fruit<br>Farm .. ..                                           | 38    | 17 | 0  |        |    |    |
| 76, Sales, produce .. ..                                                           | 113   | 15 | 4  |        |    |    |
|                                                                                    |       |    |    | 152    | 12 | 4  |
| IX—MISCELLANEOUS RECEIPTS:                                                         |       |    |    |        |    |    |
| 109, Sales, old stores and sun-<br>dries .. ..                                     | 5     | 15 | 3  |        |    |    |
| 112, Other Miscellaneous Receipts:—<br>Sales:                                      |       |    |    |        |    |    |
| Beeswax .. ..                                                                      | 182   | 9  | 5  |        |    |    |
| Expenditure:                                                                       |       |    |    |        |    |    |
| Purchase and<br>preparation .. ..                                                  | 153   | 19 | 0  | 28     | 10 | 5  |
|                                                                                    |       |    |    | 34     | 5  | 8  |
|                                                                                    |       |    |    | £1,386 | 17 | 3  |

#### SECTION IV—LEGISLATIVE CHANGES.

49. By an amendment to the Native Produce Ordinance, the Director of Agriculture has had his powers with respect to the granting of export licences for certain produce below the standard required by the Ordinance, extended to all produce now brought under the Ordinance. There were no other changes.

F. J. MARTIN,  
*Director of Agriculture.*

## Appendix I.

### ROKUPR EXPERIMENTAL RICE STATION.

Mr. R. R. Glanville was in charge from January until April and again from the middle of November to the end of the year. Mr. G. M. Roddan was in charge from April until mid-October when Mr. A. F. MacKenzie took over from him. The appointment of Mr. MacKenzie has greatly eased matters as previously, except for a brief period, there had been only one Agricultural Officer for all work in the Northern Province. Although assisting with the ordinary activities of the station Mr. MacKenzie has concentrated especially on the experimental work and he is responsible for the statistical analyses.

This station was opened in 1934. In 1935 the lay-out was further improved and good progress was made in connection with all branches of the station's activities. The handling of the harvested crop has been facilitated by the construction of a cement drying and threshing ground. The building of a rice store, which was needed, was begun in December.

The results now obtained prove that the station is very well situated and suitable for experimental and other work in connection with the main rice area. It will however be advisable at a later date to open small substations to deal with the peculiar problems of the salt and deeply flooded lands.

A small part of the station has been set aside for work with UPLAND CROPS in which the farmers near Rokupr are interested. Better methods of cultivation are being demonstrated and planting material of the following, among other crops, is being raised for distribution: Deli and Angola oil-palm, coffee, yams, cassava, pine-apple and miscellaneous fruits and vegetables.

The WEATHER was, on the whole, very favourable for the rice crop, and, as a result, although improved cultivation of the land was a contributory factor, production was considerably higher than in 1934.

The rainfall was less than normal and better distributed, and there was no damage in the nurseries by surface washing such as was caused by the exceptionally heavy rain in June, 1934. In addition, the duration and extent of flooding was less severe, and this greatly facilitated the work of transplanting.

### NURSERIES.

The fertility of the rice nurseries was maintained by the application of ashes and decayed vegetable matter. After the rice had been transplanted on the farm, green manure crops including sunn hemp, dolichos and cowpea were grown on the nursery land with fair success. This method of maintaining fertility will be fully investigated.

As regards seed rate, this was based on a rate per acre of 300 lb. for Toma which is a medium grain rice as well as the most widely grown. The proportionate rates for other varieties were calculated from this, and ranged, according to the size of the seed, from 120 lb. for Jerragasamba to 390 lb. for Kalyaman. The rate for G.E.B. 24 was 220 lb. It is estimated that a further slight reduction can be adopted with advantage.

*Piricularia oryzae* was unexpectedly severe in the nurseries and all Madras rices, including G.E.B. 24, as well as No. 79 from British Guiana, and the local varieties Bolo and D.C. pa lil, suffered particularly. It would appear that the unusually dry weather in June, when most of the nurseries were sown, was mainly responsible for the severity of the disease, as rice sown during wetter weather in July did not suffer so much. Fortunately the disease did not persist to any extent on the transplanted rice. In fact on the farm the only rice seriously affected by disease, apparently a combination of *Piricularia* and *Helminthosporium*, was the salt-resisting variety Bali. Observations made on the pure-line nurseries show that many strains have considerable resistance if not immunity to *Piricularia*, and the selection of resistant strains would appear to afford the only practical solution of the problem. Seed treatment with copper sulphate and with formaldehyde proved of little value and the Plant Pathologist considers that the failure of plants, from treated seed, to resist the disease may be attributable to the prevalence of the fungus in the soil.

#### FARM.

The preparation of the plots consisted of deep-hoeing in the dry season followed by light digging and a certain amount of levelling and puddling before transplanting was done. Very little weeding was necessary except in two blocks where wild rice was troublesome. No manuring was done nor is it likely that any will be required for many years to come.

All bunds were maintained. They have proved their value as block boundaries and as a means of affording ready access to all parts of the farm; but so far they have not been a success in connection with water-control as the innumerable breaches made by crabs, as well as damage by flood water at high tide, have made it extremely difficult to retain water on the blocks for any length of time.

A stick fence was erected along the side of the farm bounded by the river and proved effective in keeping out the floating masses of grass, etc., which would otherwise have been carried on to the farm by the flood at high tide.

#### PESTS AND DISEASES.

Crabs were plentiful and, in addition to damaging bunds, they did a small amount of harm to the actual rice plants. Soil fumigation with Cynogas was tried with fair success, but the cost was high and, in addition, relief was only temporary as reinfection from the surrounding area soon took place. Rats were troublesome on some of the plots adjoining the upland area but their activities were checked by trapping. Boys were employed to scare off birds and monkeys. Insects did little appreciable damage although solitary locusts, grasshoppers and *leptocoris* spp. were present before harvest.

*Helminthosporium* and *Piricularia oryzae* were present but only to a serious extent on Bali—one plot of which had to be destroyed—and on a small area in one corner of the Kavunginpoothala block.

#### PURE-LINE SELECTIONS.

In 1934 a commencement was made with the pure-line selection of the five most popular local varieties, namely:—Toma, Bolo, Fodea, D.C. and D.C. pa lil. The single plant selections made from the farmers' bulk sowings in 1934 were subject to the second stage of selection in 1935. The seed from each selected plant was carefully sown in separate

nursery plot and the seedling eventually transplanted in a separate small plot in the farm. The seedlings were transplanted singly, with six inches spacing, in plots of eleven rows wide. These family plots were kept under constant observation and data recorded in connection with pigmentation, flowering duration, number of tillers, height (measured to top of highest panicle), and evenness of grain. All strains showing splitting for any of these characters were discarded. Any unhealthy strains were also rejected. The following strains have so far been retained for comparative trial in 1936.

| Variety.       | Number of First Year<br>Selections under<br>Observation. |    | Number of Strains<br>retained. |  |
|----------------|----------------------------------------------------------|----|--------------------------------|--|
| Toma .. ..     | 23                                                       | 3  |                                |  |
| Bolo .. ..     | 49                                                       | 8  |                                |  |
| Fodea .. ..    | 45                                                       | 6  |                                |  |
| D.C. .. ..     | 50                                                       | 17 |                                |  |
| D.C. pa lil .. | 59                                                       | 8  |                                |  |

Two methods of recording flowering duration were tried. In the first, a plan of each family plot was made on squared paper, the position of each plant being represented by a corresponding square on the chart. Flowering was considered to have taken place as soon as the tip of a panicle had emerged beyond the ligule of a main tiller. Counts were taken on alternative days, and as each plant flowered the date was recorded on the corresponding square on the chart. This method proved too complicated for the subordinate staff and the Agricultural Officer was unable to devote sufficient supervision all the time. The method then adopted was to record the total number of flowered plants in each plot, counts being made on alternate days as before. The flowering frequencies were obtained by subtraction. This method proved much simpler and quite accurate. Any families having a flowering duration of over fourteen days were discarded. Frequency curves were drawn for those strains flowering within fourteen days. Any strains not giving unimodal curves were discarded, being regarded as heterozygous. Those giving unimodal curves were retained for examination with regard to colour and evenness of grain. Only those with white pericarp were retained for comparative trial. In each plot the two border rows were not under observation and were discarded before the selected families were harvested. At harvest a fixed number of plants, varying from fifty to one hundred with different varieties, was harvested for each strain and the grain bulked. The weight of grain was ascertained after thrashing and drying, and the grain finally stored in tins with the appropriate serial number.

Selection was commenced with the local varieties Indian and Bis, both of which have definite promise, especially Bis which is a very long duration rice of good quality. One hundred single plant selections were made in the field in each case, but this number will be reduced after examination in the laboratory. When selecting from Indian it was noticed that there was a number of plants resembling G.E.B. 24 in type of growth and grain. The most promising of these were retained for observation.

## EXPERIMENTAL WORK.

Three comparative trials were carried out during the year. In each case the lay-out used was a randomized block replicated six times. The experiments were designed for the statistical analysis of the results obtained. A summary of the results obtained is as follows:—

## I. COMPARATIVE TRIAL OF NINE MEDIUM-DURATION VARIETIES.

| 1<br>Variety.       | 2<br>Origin.   | 3<br>Yield | 4<br>Yield<br>lb./acre. | 5<br>Yield per cent.<br>of Standard. |
|---------------------|----------------|------------|-------------------------|--------------------------------------|
| Lead Rice ..        | British Guiana | 902        | 2,326                   | 110·9                                |
| G.E.B. 24 ..        | Madras         | 895        | 2,308                   | 110·1                                |
| No. 79 ..           | British Guiana | 889        | 2,292                   | 109·2                                |
| D.C. ..             | British Guiana | 845        | 2,179                   | 104·0                                |
| D.C. ..             | Sierra Leone   | 813        | 2,096                   | 100·0                                |
| Blue Stick ..       | British Guiana | 705        | 1,818                   | 86·7                                 |
| Ramcajara ..        | " "            | 673        | 1,735                   | 82·6                                 |
| Garrikassanavari .. | " "            | 626        | 1,614                   | 77·0                                 |
| Jeerasalae ..       | Madras         | 437        | 1,127                   | 53·7                                 |

*Statistical Note:*—A difference of 150 in column 3 may be regarded as significant.

In column 5 of the table the yield of D. C. (Sierra Leone) has been taken as the standard for comparison as this is the local medium duration rice. All varieties, except G.E.B. 24, which took two weeks longer, were harvested  $4\frac{1}{2}$  months after sowing.

There is a little difference in the yields of Lead rice, G.E.B. 24, and No. 79; and D.C. lags very little behind them. Although Lead rice has given the highest yield, it has the fault of shattering very easily when ripe; and, for this reason, G.E.B. 24 and No. 79, both rices of excellent quality, appear to be the most suitable medium duration varieties for the Scarcies area. Both of these varieties should be valuable as No. 79 matures about two weeks earlier than G.E.B. 24.

## II. COMPARATIVE TRIAL OF NINE LONG-DURATION VARIETIES.

| 1<br>Variety.  | 2<br>Yield. | 3<br>Yield lb./acre. | 4<br>Yield per cent.<br>of Standard. |
|----------------|-------------|----------------------|--------------------------------------|
| Bolo .. ..     | 1,016       | 2,619                | 117·0                                |
| Fodea .. ..    | 941         | 2,426                | 108·4                                |
| Lal .. ..      | 913         | 2,354                | 105·2                                |
| Co. 5 .. ..    | 913         | 2,354                | 105·2                                |
| Co. 7 .. ..    | 899         | 2,318                | 103·6                                |
| Bis .. ..      | 880         | 2,269                | 101·4                                |
| Toma .. ..     | 868         | 2,238                | 100·0                                |
| Kanlu .. ..    | 860         | 2,217                | 99·1                                 |
| D.C. pa lil .. | 732         | 1,887                | 84·3                                 |

*Statistical Note:*—A difference of 109 in column 2 may be regarded as significant.

All these are local varieties with the exception of Co. 5 and Co. 7 which are from Madras. In column 4 the yield of Toma has been taken as the standard for comparison as this variety is the most widely grown in the Scarcies area. All varieties except Bis, which took two weeks longer, were harvested  $6\frac{1}{4}$  months after sowing.

Bolo is the only variety which has given a significantly higher yield than Toma, the standard. D.C. pa lil is the only variety to give a significantly lower yield than Toma. Co. 5 and Co. 7 are pure-line white rices from Madras, but all the local varieties are composed of mixed strains with a high percentage of grain with red pericarp. For the present Co. 7, being slightly better than Co. 5 in quality, will be distributed to farmers requiring a long-duration white rice; but it appears probable that some of the pure-line selections now in progress with Bolo, Fodea, Lal, Bis and Toma will result in high yielding strains of greater value. When these pure-lines have been isolated and multiplied, a further comparative trial will be carried out. It appears probable that a selection of Bolo will be particularly valuable.

### III. COMPARATIVE TRIAL TO DETERMINE THE EFFECT OF SPACING AND NUMBER OF PLANTS PER STAND, ON THE YIELD OF G.E.B. 24 RICE, A FIVE MONTHS VARIETY.

| 1<br>Treatment. |        |          |       | 2<br>Yield. | 3<br>Yield lb./acre. | 4<br>Yield per cent.<br>of Standard. |
|-----------------|--------|----------|-------|-------------|----------------------|--------------------------------------|
| 5               | plants | 6"x 6"   | .. .. | 451         | 2,729                | 148·8                                |
| 3               | "      | "        | " ..  | 424         | 2,565                | 139·9                                |
| 1               | "      | "        | " ..  | 407         | 2,462                | 134·3                                |
| 5               | "      | 9"x 9"   | .. .. | 303         | 1,833                | 100·0                                |
| 3               | "      | "        | " ..  | 302         | 1,827                | 99·7                                 |
| 1               | "      | "        | " ..  | 207         | 1,252                | 68·3                                 |
| 5               | "      | 12"x 12" | .. .. | 213         | 1,289                | 70·3                                 |
| 3               | "      | "        | " ..  | 166         | 1,004                | 54·8                                 |
| 1               | "      | "        | " ..  | 92          | 557                  | 30·4                                 |

*Statistical Note* :—A difference of 61 in column 2 may be regarded as significant.

The yield of the treatment 5 seedlings planted 9" x 9" was taken as the standard of 100% as this approaches the local practice most closely. The local farmers generally tend to plant about 10" apart with an average of about seven seedlings per stand.

The results obtained are remarkable in that the spacing in the case of one plant per stand has had little apparent effect on the yield of the individual plant. As the experiment stood, the yield, with single plant stands, was approximately proportionate to the number of plants per unit area.

It is evident that, within the limits of the experiment, spacing, as such, had little effect on the yield of the plant—i.e. its tillering—but with more than one plant per stand the yield of each was reduced, and the reduction was greater as the number of plants per stand increased and spacing diminished.

The greatest return per unit of seed sown was obtained with single planting and 6"x 6" spacing. Increasing the number of plants per stand at this spacing did not raise the yield to any significant extent, but definitely reduced the return per unit of seed. There is however an indication—though only statistically significant in this experiment with the wider spacings—that increasing the number of seedlings to 3 or 5 per stand will increase the yield per acre sufficiently to more than compensate for the extra seed required per unit area.

It should also be recorded that with a spacing of 12"x12" there was a tendency to less even tillering, and in addition there was an appreciable growth of weeds which were checked by closer planting.

It is clear from the results of the experiment that farmers can benefit greatly by planting closer and using fewer seedlings to the stand. Assuming that the existing practice is to plant seven seedlings in stands about 10" apart, it follows that if farmers can be taught to plant about three seedlings with 6" spacing they can increase the production of their farms by as much as up to 50% without any considerable increase in the amount of seed used.

It is expected that many farmers will willingly attempt to follow our advice, but its general adoption may be slow, as at present the bulk of the planting is done by casual and almost uncontrolled labour, which invariably attempts to complete the work as quickly as possible by planting widely with a large number of seedlings to the stand.

**SEED RATE AND TIME IN NURSERY.**—A preliminary test was carried out to provide information to serve as a basis for an experiment, under statistically controlled conditions, to determine the optimum seed rate and time in nursery for the variety G.E.B. 24. The result indicated that a sowing rate of 200 lb. per acre of seed bed, and a period of about 8 weeks in the nursery, would probably give the best returns.

**SOIL UNIFORMITY TESTS.**—Eight blocks were planted up for testing, but growth was so uneven in the case of five that only three were eventually retained for testing. The results for these three blocks have not yet been worked out.

**MAINTENANCE OF VARIETIES.**—All introduced rices and local varieties undergoing selection or observation were grown in separate maintenance plots, the border rows of which were discarded at harvest. The purpose of these plots includes the maintenance of purity of introduced varieties; the maintenance of controls for comparative trials with selections from local varieties; and the provision of material for observation.

### GENERAL MULTIPLICATION.

To meet the demand for large quantities of G.E.B. 24 seed rice for general use in the Scarcies area, about half of the farm was planted up with this variety. Other important varieties which were multiplied to meet demands on the farm and in the rice areas included Bali, Co. 7, Kavunginpoothala, Panianala, and Baitel Fakir. The total production from the farm was 344 bushels which is 138 bushels more than the 1934 crop.

The following list shows all the varieties grown on the farm and the quantities of seed now available :—

| Variety.            | Type.                   | Origin.             | Seed in lb. |
|---------------------|-------------------------|---------------------|-------------|
| Bali .. ..          | Salt resisting ..       | Madras, 1931 ..     | 806         |
| Indo-China ..       | Deep-water, floating .. | Fr. Guinea, 1928 .. | 146         |
| Kar .. ..           | „ erect ..              | Madras, 1931 ..     | 5           |
| Panianala ..        | „ „ ..                  | „ „ ..              | 380         |
| Baitel Fakir ..     | „ „ ..                  | „ „ ..              | 256         |
| Kavunginpoothala .. | „ „ ..                  | „ 1934 ..           | 1,018       |
| Adt. 3 .. ..        | Short-duration ..       | „ 1931 ..           | 1           |
| Co. 5 .. ..         | Long-duration ..        | „ „ ..              | 118         |
| Co. 7 .. ..         | „ .. ..                 | „ „ ..              | 2,469       |

| Variety.            | Type.           | Origin.          | Seed in lb |
|---------------------|-----------------|------------------|------------|
| Jeeragasamba ..     | Medium-duration | Madras, 1931     | 35         |
| G.E.B. 24 ..        | " "             | " "              | 10,238     |
| Jeerasalae ..       | " "             | " 1934           | 54         |
| Maskathi ..         | " "             | " "              | 7          |
| Thayalakkaman ..    | " "             | " "              | 7          |
| Blue Stick ..       | " "             | Br. Guiana, 1934 | 105        |
| No. 79 ..           | " "             | " "              | 109        |
| D.C. ..             | " "             | " "              | 113        |
| Lead Rice ..        | " "             | " "              | 128        |
| Ramcajara ..        | " "             | " "              | 92         |
| Garrikassanavari .. | " "             | " "              | 70         |
| D.C. ..             | " "             | Local            | 407        |
| Bathurst ..         | " "             | " "              | 22         |
| Bis ..              | " "             | " "              | 169        |
| Bolo ..             | " "             | " "              | 345        |
| D.C. pa lil ..      | " "             | " "              | 2,603      |
| Fodea ..            | " "             | " "              | 305        |
| Kindi ..            | " "             | " "              | 21         |
| India ..            | " "             | " "              | 126        |
| Lal ..              | " "             | " "              | 188        |
| Kanlu ..            | " "             | " "              | 91         |
| Toma ..             | " "             | " "              | 200        |
| Yarat ..            | " "             | " "              | 16         |

Total—20,650 lb.—344 bushels.

Indo-China rice, a deep-water variety of the floating type, was tried at Rokupr for the first time. It was however a comparative failure and is obviously not suitable to tidal areas. It should however do well in deeply flooded non-tidal swamps in which there is a slow steady rise of water. Introduced varieties which promise to be valuable acquisitions are Kavunginpoothala, Co. 7, G.E.B. 24, No. 79 and, possibly, Co. 5, Blue Stick, Lead Rice and Bali.

The following varieties are disappointing and will probably be discarded without further trial—Kar, Adt. 3, Jeeragasamba, Jeerasalæ, Maskathi, Thayallakaman, Ramcajara, and Garrikassanavari.

G.E.B. 24: This rice has done very well, whether planted early or late, under widely varying conditions of soil and flooding. As reported elsewhere this variety is now being issued for general use as a medium duration rice in the Scarcies area. Ninety bushels of pure-line seed were distributed to farmers and the crop purchased back under the scheme financed by the Colonial Development Fund. 1,441 bushels of seed are available for distribution in 1936.

R. R. GLANVILLE,  
*Agricultural Officer, Northern Province.*

## Appendix II.

### NEWTON EXPERIMENTAL FRUIT FARM.

The reporting officer was in charge from the beginning of the year until June 1st and from November 15th until the end of the year. During the intervening period Mr. E. I. Nisbet divided his time between Newton and Njala.

The CITRUS EXPERIMENTS, described in detail in the annual report for 1933, have now been abandoned. It had been realized for some time that the soil on which these experiments were laid out was sandy and deficient in organic matter, and in my report for 1934 I mentioned several factors which had militated against success, including poor soil and "trunk rot." The latter became very serious and although scraping of the diseased or dead bark and wood, and disinfection of the wounds, was carried on continuously and arrested the spread of the disease in many cases, a number of the trees died. In June the Director, in company with the Mycologist, visited the plantation and the following is a short extract from his report to Government :—

"Too many trees have now been affected for this attack to be considered anything but disastrous from the experimental point of view, and I have reluctantly to recommend that the experiments on citrus commenced at Newton should be abandoned." Work on these experiments was therefore discontinued.

In the CITRUS NURSERY budding has been confined entirely to Marsh grapefruit and Lu Gim Gong orange on sour orange stocks. The numbers of citrus plants distributed during the year are shown in Appendix VII.

The DRY-LAND BANANA EXPERIMENTS were continued and the heavy mulching resulted in a much better growth. The cost of mulching however is high and it is doubtful if this form of cultivation on this soil would be economical. The Agricultural Adviser to the Secretary of State who visited the farm in January, 1936, was of this opinion and, in accordance with his advice these banana experiments will be dropped.

The SWAMP-LAND BANANA EXPERIMENT, described in the report for 1934, has been very successful; the average weight of the first crop of bunches was 52 lb. 5 oz. It was decided to extend the area of drained swamp under cultivation and a start was made towards the end of the year.

In the PINE-APPLE EXPERIMENTS dating of the suckers was commenced in December, 1934, and the information as to the time required for suckers of the various types to produce fruit will be available when they bear next year. All of the pine-apples have been mulched, irrigated during the dry season and given one application of fertilizer at the following rates :—

|                     |    | Per Plant.           | Per Acre.            |
|---------------------|----|----------------------|----------------------|
| Sulphate of ammonia | .. | .. $\frac{1}{2}$ oz. | Approximately 2 cwt. |
| Superphosphate      | .. | .. $\frac{1}{2}$ "   | " 2 "                |
| Muriate of potash   | .. | .. $\frac{1}{2}$ "   | " 2 "                |

This is approximately a 7:6:3:16.6 fertilizer. Several thousand pine-apples of the varieties Red Spanish, Queen, Smooth Cayenne and Baronne de Rothschild have now been planted. They have done very well and further experimental work is planned for next year.

*Robusta* and *stenophylla* COFFEE have again been grown in nurseries for distribution in the Colony during 1936.

The following varieties of CASSAVA have also been grown and kept free from mosaic disease with a view to supplying farmers with healthy propagating material: Asia Minor, Cotton Tree, Kanda, Shenge, T-cent, Mayugbe, Samuya, White Leaf.

METEOROLOGICAL RECORDS have been kept throughout the year.

E. S. GARNER,  
*Agricultural Officer*

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### Appendix III.

#### PRODUCE INSPECTION.

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*Palm Kernels.*—The year, opening with prices equal to the highest paid in 1934, gave rise generally to an optimistic outlook of better times ahead, and as time went on, this became more established with prices which ranged from £4 12s. 6d. at the beginning of the year and gradually increased to £7 10s. 0d. at the end of December.

Railments and export show a very satisfactory return for the year, the former amounting to 43,106 tons, an increase of 9,181 tons compared with last year, and the latter establishing a record for Sierra Leone with 78,019 tons, of which quantity 54,473 tons were exported from Freetown, 22,797 tons from Bonthe, 3 tons from Mano Salija and 746 tons from Sulima.

The standard of purity throughout the year was consistently maintained, and satisfaction among the firms concerned with this form of produce was general.

The exports of kernels from Sulima again showed an increase and this year amounted to 186 tons in excess of those of 1934.

*Palm Oil.*—Railments for the year amounted to 1,622 tons and exports to 2,892 tons; there was a decrease of 141 tons in the former but an increase in the latter of 667 tons when compared with exports of the previous year.

The quality of oil in all districts was substantially in conformity with the requirements of the Native Produce Ordinance.

*Piassava.*—Exports from the principal ports were as follows: Freetown 261 tons, Sherbro 793 tons, Sulima 2,237 tons and Mano Salija 147 tons, total 3,436 tons. This, when compared with the previous year, shows a decrease of 221 tons. While Sulima and Mano Salija exports were less than those of the previous year, those of Freetown and Sherbro returned an increase of 157 and 46 tons respectively. Propaganda for the better cleaning of the fibre has been carried out on all areas.

In respect to the quality exported from Sulima there has been marked improvement. The task of persuading the native producers to improve their methods of preparation for the market by means of better selection when first cutting, longer periods of retting and greater care in drying, has been difficult; it is however gratifying to report that producers are beginning to realize the advantages they derive from better preparation and are gradually improving.

The quality exported from Sherbrō has been maintained throughout the year, though considerable quantities have at times been referred back to owners for reconditioning in order to comply with the standard prescribed by the Native Produce Ordinance; the strict vigilance kept upon all stocks, and subsequent inspection of reconditioned material has successfully prevented sub-standard quality from being exported.

The piassava prepared from small inland swamps, mostly adjacent to the main railway line, has not, by reason of the coarseness of its fibre, been well received by Sierra Leone dealers; in consequence, producers have been discouraged to such an extent when trying to sell their material that there is little hope for future development of the industry in these areas.

*Ginger.*—Exports amounted to 1,506 tons, a decrease of 153 tons in comparison with those of last year.

Towards the latter part of the year, a scheme to encourage farmers to prepare a better quality of ginger for the market was commenced. With the co-operation of administrative officers, meetings and gatherings of growers and dealers were held in the principal towns by the Inspector of Plants and Produce who explained and demonstrated how improvement could be brought about by farmers themselves during the forthcoming season.

Instructors have been employed to tour farming areas, encouraging and advising growers at the time of harvesting. Results so far have been most satisfactory, and though the season was late, the quality of ginger offered for sale was a great improvement upon that of recent years.

*Rice.*—There were ample supplies to meet the requirements of home consumers and exporters. Exports amounted to 1,023 tons, an increase of 802 tons when compared with those of 1934. Rice was examined before export.

*Beeswax.*—A shipment of beeswax amounting to  $37\frac{1}{2}$  cwt. was made this year. It was well reported upon and was sold at a price in excess of the then market quotation. The process used in clarification has been simplified so that native producers can in their own villages prepare clean wax for the market. The wax exported this year was prepared by a labourer who had previously received instruction, thereby demonstrating the possibility of cleaning by native method without the use of cumbersome or expensive machinery.

*Staff.*—The Inspector of Plants and Produce was on vacation leave from the 22nd May to the 25th of October.

*Prosecution.*—The number of persons reported for infringement of the Native Produce Ordinance amounted to 94: of these 85 were convicted, 5 discharged and 4 remaining to be dealt with.

*Weights and Measures.*—The verification of weights and measures was carried out by the Inspector of Plants and Produce during the year and 146 certificates of justness were issued.

F. W. B. ALLINSON,  
*Inspector of Plants and Produce.*

## Appendix IV.

### ENTOMOLOGICAL WORK.

The prolonged dry season, which presumably occurred also in countries adjacent to Sierra Leone, appeared to have marked effect on eel-worms and some insects. There was a noticeable decrease in degree of eel-worm infestation; the mass influx of *Achæa catocaloides*, Guen. was a month later than usual and prevented the development of a second local generation; there was no breeding of *Othreis* spp. during the late months of the year: it probably also played a large part in:—the great decrease in *Zonocerus variegatus*, L., increases in termites affecting vegetation and in the scale insect *Selenaspidus articulatus*, Morg. on Citrus.

The following account of work is arranged under the crop concerned or other appropriate heading.

**CASSAVA.**—Further trials were made at Njala of an Aleurodid as a carrier of mosaic disease, but no symptoms were produced; incidentally it was found that a period of four weeks was required for the development of a complete generation. Mechanical inoculation trials also failed. Later work will be done in a district where the disease is more prevalent.

With regard to the question of relative disease-resistance of varieties leaf-character from the standpoint of insect preference may be of importance, and counts of insects present on 300 leaflets of each of 22 varieties indicated that those with smooth leaves, which include the resistant types, were much less favoured than others by Aleurodids.

**CITRUS.**—Spraying results are not yet available. The dry season was severe, and fruit piercing moths did not appear in quantity until the end of April when they appeared in such enormous numbers that the poisoned-bait could not cope with them quickly enough. The result was that during the ensuing two to three weeks there were very many windfalls, and even unripe fruit was attacked. The bait, however, reduced *A. catocaloides*, Guen. to practically negligible proportions within a week: incidentally there was only one locally bred generation of this species, as compared with two when the moths appear at the usual time. Other species of *Achæa*, as well as those of *Anua*, *Othreis* and *Serrodus*, were also more numerous than usual. An increase in number of tins of poisoned-bait set out is indicated and this will be tried in future seasons.

In the laboratory, trials of bait with *Othreis fullonica* L., *O. divitiosa* Wlk., *Achæa* spp. and *Serrodus* spp. in the presence of suitable fruit showed that the two larger species died within 48 hours of feeding and the others within 24 hours; the bait was preferred to the fruit except in one case where a fully ripe grape-fruit was included. A bait containing sodium fluosilicate in place of sodium arsenite promises to be equally effective.

Additional larval food-plants found are; *A. catocaloides*—*Alchornea hirtella*, *Byrsocarpus coccineus*, *Cnestis ferruginea*, *Cola nitida*, *Combretum comosum*, *Connarus africanus*, *Costus afer*, *Dichapetalum toxicarium*, *Dioscorea hirtiflora*, *Leptoderris*, cf. *L. brachyptera*, *Macaranga huræfolia*, *Millettia Barteri*, *Napoleona Heudelotii*, *Ochthocosmus africanus*, *Sorindea juglandifolia*, *Uvaria chamæ*; for *A. czea*, Cram.—*Combretum comosum* and *C. mucronatum*; for *A. faber*, Hall.—*C. Comosum*; for *A. lienard*

Boisd.—*C. comosum*, *C. mucronatum*, *Napoleona Heudelotii*, *Ochthocosmus africanus*, *Phyllanthus discoideus*; for *Anua mejanesi*, Guen.—*C. comosum*; for *Serrodes partita*, F.,—*Lecaniodiscus cupanioides*; and for *S. trispila*, Mab.—*Deinbollia pinnata*.

The Coccid, *Selenaspidus articulatus*, Morg. showed considerable increase on fruit, and *Argyroploce leucotreta*, Meyr. was found on grape-fruit for the first time.

COFFEE.—The borer, *Xyleborus morstatti*, Eggers, was much more abundant than usual in the latter part of the year.

A native host (*Heinsia pulchella*) of the coffee-berry Lycænid (*Virachola bimaculata*, Hew.) has been found which provides food for the insect when coffee is not available.

GROUND-NUT.—Shade and spacing trials, with special reference to virus diseases, were again carried out and, as previously, no disease symptoms appeared on plants in the shaded plot; in another plot in partial shade, only one plant became infected. With regard to spacing, the 9" x 9" gave a final rate of 9%, the 10" x 10" of 26%, the 12" x 12" and 14" x 14" of 35% infection. Cassava is being made use of in further shade trials.

Since *Aphis laburni*, Kalt., the carrier of ground-nut virus disease, is now found to occur also on cowpea, trials are in progress to find if there is any connexion between the virus diseases of the two crops; a typical symptoms were produced on cowpea by aphids infected with ground-nut virus.

COWPEA AND BEANS.—Virus diseases were very prevalent on cowpea, *Canavalia* and French bean, and some also occurred on Lima bean which appears to be less susceptible. It is probable that there are more viruses than one, and mechanical inoculation trials show that disease is readily transmissible from one plant to another, but symptoms vary somewhat in the different hosts and these are being correlated: trial is also being made of the commoner insects occurring on these plants to determine the insect or insects acting as vectors.

VARIOUS.—The main primary cause of scabs on the fruit of guava is apparently *Argyroploce leucotreta*. Maize and millets were seriously attacked by *Aphis sorghi*, Theob., *Diaperasticus erythrocephalus*, Ol. and *Chatocnema zea*, Bry., against which a lead arsenate-nicotine sulphate spray was effective. *Calandra oryzae*, L., was present to some extent on rice ears in the field. *Pyrops tenebrosus*, F. attacked French bean and tomato.

LOCUSTA MIGRATORIA.—R. & F. About 70 reports of swarms were received during the year, mainly in February and March, one in November, and some hoppers developed during May and June. Slight damage was done to late rice by the adults, and later to young rice. Inspection of "damaged" farms again showed that increased tillering had resulted in most cases; in some, yield must have been definitely increased. The usual monthly reports were submitted.

*Zonocerus Variegatus*, L.—This insect was relatively uncommon, probably as a combined result of the high degree of parasitisation during 1934 and the extended drought; very few hoppers hatched out in the later months of the year, and there was no distinct generation.

TERMITES.—There was abnormal extension of infestations which were treated with carbon bisulphide, paradichlorobenzene, Paris green or lead arsenate according to circumstances: a 0·1% solution of Potassium cyanide promises well against the grass-attacking species.

REFERENCE COLLECTION. About 1,300 specimens were submitted to the Imperial Institute of Entomology, and determinations included thirteen new species and twenty species new to the British Museum. Fresh records are:—*Bruchus obsoletus*, Say on imported bean seed, *Bruchus ornatus*, Roh. on *Vigna sinensis*, *Bixadus Sierricola*, White boring in coffee, *Pseudococcus citri*, Risso on *Anisophyllea laurina*, *Thrips exilicornis*, Hood on flowers of banana and citrus, *Monohammus ruspator*, F. boring in cassava, and *Xyleborus morstatti*, on *Bauhinia tomentosa*: *Bruchus analis*, F. was also noted in imported bean seed.

MISCELLANEOUS.—The Entomologist was on leave from February 20th to July 27th.

E. HARGREAVES,  
*Entomologist.*

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## Appendix V.

### MYCOLOGICAL WORK.

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(Diseases are dealt with under the headings of the crops affected: the crops are placed in alphabetical order.)

BANANA.—A wilt disease was seen in August on some of the Cavendish bananas growing at Newton in moist soil in the valley and in the plots on drier land. The disease was considered to be bacterial wilt caused by *Bacterium solanacearum*. A Zinnia wilt recorded at the same time and a wilt of Canna at Njala were very likely caused by the same organism.

*Marasmius stenophyllus* was seen on Cavendish bananas in Freetown in August. This is the first record from the Colony.

BEANS.—Many seedling french beans (*Phaseolus vulgaris*) in a garden at Njala were affected by a wilt disease in October. A species of *Pythium* was isolated, and considered by the Imperial Mycological Institute to be a species near *P. myriotylum* Drechsl. The fungus was found to be vigorously pathogenic to unwounded french bean seedlings in the laboratory, causing collapse of the stem in thirty hours. Under moist conditions the stems were covered with the woolly mycelium of the *Pythium* two days after inoculation. The mycelium spread over the soil and attacked other seedlings in its path. Inoculation trials on wounded and unwounded sword bean, cowpea, Lima bean and sunn hemp seedlings were unsuccessful.

Seedlings of scarlet runner beans (*Phaseolus coccineus*) at Njala in April were killed by a fungus which appeared to be *Macrophomina phaseoli* though unfortunately only immature pycnidia were seen on the stems and there was no opportunity to isolate the fungus for identification in culture. The fungus was definitely identified on old french beans in an adjacent bed, but as in the case of previous records, no significant damage was caused, and there is no record from Sierra Leone of its attack on young french bean plants. The fungus has been recorded from Newton this year, on the ornamental edging "*Alternanthera*" (*Telanthera*).

Seedlings of *Canavalia ensiformis* at Newton in June were seen to be rotted just above or below the cotyledons. A *Fusarium* was present which in culture gave rise to perithecia of *Neocosmospora vasinfecta* Smith, though the ascospores are rather smaller than the type, being 7-10 x 7-9 microns (very usually 9 x 8 microns) and the exospore is more lightly coloured. Inoculation trials in the laboratory on both wounded and unwounded sword bean seedlings were in all cases unsuccessful.

BULRUSH MILLET (*Pennisetum leonis*). Rust, *Puccinia penniseti*, was recorded for the first time in Sierra Leone at Njala in November. The fungus caused little damage, and was found only on a few leaves on a small number of plants in one farm.

CITRUS.—As the result of the unusually long dry season the spring leaf and flower flush at Njala and elsewhere did not appear till the end of May, two months later than in 1932 and 1933 and five to six weeks later than in 1934. The newly set fruit was thus in the susceptible stage for scab infection in June and July when the rainy season was well begun. The fruits showing scab lesions were 49% of the total harvest, the same percentage as in 1933. In addition, about 11,500 young fruits (or about 14% of the crop) were shed in July, nearly all badly scabbed. Individual trees of the same age and variety and growing under similar conditions yielded fruit varying between 0 and 98% free from scab. On the whole, Foster trees gave a considerably higher percentage of scab-free fruit than Marsh.

In view of recent accounts from other countries of the efficiency of lime-sulphur in the control of scab, trials were carried out at Njala with "Sulfinette" this year at 1:50 strength, the spray being applied at the height of blossoming, and twice subsequently at monthly intervals. No significant difference was found in regard to scab infection between fruit from sprayed and unsprayed trees.

The Agricultural Officer, Southern Province, has carried out colouring experiments with grapefruit at Njala and has noted the effect on *Diplodia* stem-end rot of debutting immediately after colouring. Removal of buttons immediately after colouring reduced stem-end rot by over 75%, the number of rotted fruits out of nearly 9,000 debudded grapefruits averaging well under 1%.

A few further cases of psorosis have appeared among the Late Valencia and Washington navel oranges at Njala. The affected trees have been uprooted and burnt as soon as the disease has been identified.

At Newton in the early months of the year, the Agricultural Officer reported a severe outbreak of a disease involving wilting and subsequent death associated with extensive discoloration of the wood, but no external gum production or cracking. Surgical work carried out by the Agricultural Officer saved the majority of the affected plants, but had to be so severe in many cases that the plants could not afterwards be considered suitable for experimental plots. The disease was common all over the plantation and nursery, and though the cause was not determined it is considered probable that the disease was at least rendered more severe by the poorness of the Newton soil.

A disease of sour orange seedlings was present in the nursery at Njala and cases were also seen at Newton. At Njala it appeared very suddenly on a number of unsuccessfully budded plants, in the second half of June. A longitudinal streak of corky outgrowths appeared below one of the budding scars and usually the bark developed a crack at each side of this streak, the intervening area of bark becoming sunken. Gum production occurred. By the time the cracks appeared, the wood was discoloured half way in to the pith. No mycelium was found in the discoloured wood except a little *Diplodia* in the outermost parts. The plants appeared to recover after a few months, though for safety they were not used again for budding. It seems likely that the disease is a reaction to unsuccessful budding when the scar does not heal well. It occurred at Njala chiefly on plants on which budding had been attempted in October and November. Possibly, infection of the scar by *Diplodia* and other fungus is necessary for the development of the reaction.

**COTTON.**—Rust, *Cerotelium gossypii*, was common at Njala on the leaves of *Gossypium hirsutum* and *G. peruvianum*. It was also collected from Batkanu on *G. hirsutum*.

**HIBISCUS.**—*Aecidium garckeianum* P. Henn. was recorded on "sour-sour" (*H. sabdariffa*) at Newton and Mano. The leaves of the affected plants are covered with groups of æcidia mainly situated on the under surface. Even the youngest leaves are sometimes affected. The diseased plants are stunted and pale in colour. The fungus has also been recorded on the wild *Hibiscus surrattensis*.

An olive-brown "leaf mould," chiefly on the under-surface of the leaves, was common in December at Njala on okra (*H. esculentus*). The fungus is a species of *Cercospora* belonging to section VI of Stevens and Solheim. In general appearance, the disease resembles somewhat the tomato leaf mould caused by *Cladosporium fulvum*. A similar *Cercospora* has been recorded on the wild tiliaceous tree, *Christiana africana*, at Njala.

**RICE.**—Seedlings at Rokupr were severely attacked by *Piricularia oryzae*, especially some of the recently introduced varieties and, in particular, G.E.B. 24 and Co. 7: G.E.B. 24 was attacked in the nurseries all over the Scarcies. It is possible that resistant strains of some varieties may be selected at Rokupr later. Later sowings at Rokupr (in the wetter months of July and early August instead of June) escaped severe infection and this may on occasion be a practical method of control for the disease. Infection of the ear was apparently rare.

A species of *Piricularia* occurs on the wild grasses *Oryza barthii* and *Paspalum vaginatum* at Rokupr, but in view of its longer spores it is likely that this is another species of *Piricularia* and it is therefore doubtful whether it can infect rice.

*Nigrospora oryzae* was recorded on leaves of rice seedlings near Njala and elsewhere, but causing negligible damage.

**MISCELLANEOUS FUNGI.**—*Corticium (Rhizoctonia) solani* was common on ginger on the Experimental Farm at Njala from August onwards, associated with white spots on the leaves. The mycelium and sclerotia, nevertheless, were to be found covering most parts of the leaves and stems without apparently causing any damage. This white leaf spot disease, always associated with a small-sclerotial form of *Rhizoctonia*,

is common everywhere on ginger and undoubtedly causes earlier death of the above-ground parts of the plant, but the effect on the yield is not known. The fungus attacked the leaves of the weed grasses *Pennisetum subangustum* and *Rottboellia exaltata* coming in contact with the diseased ginger leaves, though in the ordinary way these grasses have not been seen attacked by *Rhizoctonia*.

On the Experimental Farm at Njala, a form of *Corticium solani* with larger sclerotia was common on the leguminous cover crops, *Pueraria*, *Calopogonium* and *Centrosema*. *Dolichos*, however, was attacked by the form with small sclerotia, as was *Phaseolus lunatus*. It is the small sclerotial form which is so common in gardens on most cultivated plants.

*Sclerotium "rolfsii"* attacked *Canavalia* grown as a cover crop this year on the Njala Experimental Farm, and *Phaseolus lunatus* at Makeni.

*Corticium solani* was recorded for the first time this year on wild host plants. The fungus was seen on a seedling of *Sterculia tragacantha* at Newton and on *Waltheria lanceolata* at Njala: in the former case, the fungus was the form with large sclerotia. *Sclerotium "rolfsii"* has not yet been recorded on a wild host.

*Myrothecium roridum* has been recorded as the cause of leaf spots on a number of hosts. It has already been recorded on the wild *Rinorea liberica* (as *Epidochium* sp. in the last report), and on *Impatiens*. New records have been made on the following cultivated plants; *Hibiscus esculentus*, *Luffa acutangula*, *Trichosanthes anguina*, and *Corchorus olitorius*. In none of these cases was the fungus causing any considerable harm.

*Cercospora canescens* was recorded on older leaves of *Hydrangea* and african marigold (*Tagetes*), on fruits of *Bauhinia acuminata*, and on moribund stems of *Cosmos sulphureus* and *Coreopsis tinctoria*. It would appear to be a common weak parasite and has never been recorded as the cause of any serious disease in this country.

VIRUS DISEASES were recorded for the first time on *Phaseolus lunatus* (rugose and mosaic forms), *Canavalia ensiformis* (mosaic), and a wild species of *Indigofera* (mosaic) in the vicinity of Njala; and a mosaic on yellow yam and a wild species of *Dioscorea* at Njala and Rokupr.

MINOR RECORDS were: *Cercospora beticola* (probably), on beet at Rokupr and Njala; *Cercospora henningsii*, on Ceara rubber at Rokupr (not common); *Cercospora* sp. of *canescens* type, common probably everywhere on *Clerodendron scandens* and also recorded on *C. fragrans* at Njala; *Cercospora stizobii*, on the wild *Mucuna pruriens* as well as on the cultivated *Stizolobium aeternum* (Bengal bean); *Cercospora* spp., on *Cercestis afzelii*, *Gynura cernua*, *Melochia melissifolia*, *Physalis angulata*, and on *Petunia*; *Choanephora* sp., attacking flowers of *Crotalaria retusa* and causing die-back from the seat of infection; *Glaeosporium* spp., associated with fruit rots of guava and the wild *Conopharyngia longiflora*; *Helminthosporium turcicum*, on *Sorghum gambicum* var. *celsum*; *Hemeleia scholzii* on *Clerodendron paniculatum*; *Irenina sepulta*, on *Avicennia nitida* (recorded before as *Meliola cookiana*); *Meliola bicornis*, on *Pterocarpus santalinoides* (recorded before as *M. acaciarium*); *Meliola borneensis*, on *Uvaria chamae*; *Meliola densa*, on *Eugenia calycina*.

and *E. calophylloides*; *Oidium* sp. (?*Erysiphe cichoracearum*), on leaves of *Phlox drummondii* and papaw, on leaves of the wild plants *Albizzia zygia*, *Crotalaria retusa*, *Elephantopus scipulus* and *Euphorbia hirta*, and on fruit of the wild *Cissus afzelii*; *Ovularia* sp., on leaves of Cinnamon; *Parodiella perisporioides*, on *Desmodium linearifolium*; *Phyllosticta cucurbitacearum* (probably), on *Cucurbita* and *Trichosanthes*; *Phytophthora parasitica*, in stem of papaw; *Sphaerostilbe repens*, in roots of papaw causing wilt, and in bulbs of *Zephyranthes tubispatha*.

The following identifications of fungi not previously recorded in Sierra Leone have been received from the Imperial Mycological Institute: *Aecidium bomolense* Syd., on *Adenia cissampeloides* and *A. lobata*; *Aecidium flavidum* Berk. & Br., on *Pavetta nitida*; *Aecidium Jasminicola* P. Henn., on *Jasminum pauciflorum*; *Aecidium? phyllanthi* P. Henn., on *Phyllanthus discoides*; *Cercospora batatae* Zimm., on *Ipomæa involucreta* and *I. setifera*; *Cercospora citrullina* Cke., on *Citrullus vulgaris* (what appears to be the same fungus was later recorded on *Trichosanthes*); *Cercosporina ricinella* Sacc. & Berl., on *Ricinus communis*; *Cymatella* sp. nov., on leaves of *Leptoderris fasciculata*; *Fusarium semitectum* Berk. & Rav. majus Wr., on leaves of *Cordyline terminalis* var. *ferrea*; *Helminthosporium flagellatum* Yates, on sooty mould on kola and coffee; *Meliola clavulata* Wint., on *Ipomæa cairica*, *I. learii* and *I. setifera*; *Mimema* sp., on *Cassia sieberiana*; *Puccinia andropogonis* Schw., on *Andropogon gabonensis* and *A. tectorum*; *Puccinia heterospora* B. & C., on *Sida urens*; *Septoriella philippinensis* Sacc., on *Saccharum spontaneum* var. *ægyptiacum*; *Sphaelia* sp., on *Paspalum scrobiculatum*; *Uredinopsis macrospora* Magn., on *Pteridium aquilinum*; *Uromyces* sp., on *Milletia rhodantha*; *Ustilago flagellata* Syd., on *Chasmodium afzelii* and *Rottbællia exaltata*. The following entomogenous fungi: *Aspergillus candidus* Link., group, doubtfully parasitic on larva of *Othreis fullonica* and also found on dead beetle; *Empusa apiculata* Thaxt., on flies; ? *Empusa grylli* (Fresen.) Nowak, on termites; ?*Entomophthora aphidis* Hoffm., on *Aphis medicaginis* on *Gliricidia*; *Gibellula araneorum* (Schw.) Syd., on spiders; an *Isaria*-like fungus on subterranean noctuid pupæ. The following culture weeds: *Absidia lichtheimi* (Luc & Const.) Lendner *Cerotostomella paradoxa* Dade; *Spegazzinia ornata* Sacc.

Some 250 specimens of fungi and 160 specimens of flowering plants were despatched during the year to the Imperial Mycological Institute and to the Royal Botanic Gardens, Kew, respectively, duplicates being placed in the HERBARIUM.

F. C. DEIGHTON,  
Mycologist.

## Appendix VI. NJALA OIL-PALM PLOTS.

Cultural operations were the same as in previous years. In the last quarter of the year the inflorescences were disturbed on certain Nigerian and Angola palms as a result of breeding work.

The yield of all plots, except the Henoi palms which showed a slight increase, was lower than last year. The yield of the Nigerian and Kpoei palms was less than, and of the Kawei palm little more than half

that in 1934. The reduction in yield corresponds with a decrease in number of fruit bunches harvested in the plots affected. Except in the case of the Nigerian palms, the average weight of bunch harvested and of fruit per bunch is higher than in 1934.

There was a marked diminution in the number of female inflorescences at anthesis during the second half of 1934 and the first half of 1935 in the Nigerian, Kawei and Kpolei plots: figures were normal for the Henoi and Angola palms, whose 1935 yields were about the same as in 1934. It is obvious that the exceptionally long drought in the early months of 1935 cannot be held responsible for the lower yields this year, nor were weather conditions in 1933-34 obviously abnormal. It would appear that at least the Nigerian and Kpolei palms are recovering from their "resting phase" as the number of female inflorescences which flowered in the second half of 1935 is more normal.

The NIGERIAN PALMS are in their fifteenth year after planting. One palm of the thin-shelled (A) group died in July. The kinds and number of the trees in the plot at the end of 1935 were:—

|                     |                                    |
|---------------------|------------------------------------|
| Thick-shelled (B)   | 159                                |
| Thin-shelled (A)    | 142 (exclusive of "togbui" type)   |
| Medium-shelled (C)  | 15 (arbitrary group)               |
| Togbui (shell-less) | 7 (included with A in the records) |
| Undetermined        | 9                                  |
| Total               | 333.                               |

20 trees of the A, 18 of the B, and 2 of the C group did not fruit in 1935. In addition, the A type tree which died during the year bore no fruit. A few of these trees are low yielders, but more than half are trees which have given average yields in the past.

The figures for the YIELD of the different groups, the yield of the whole plantation, and of averages, etc., are given in Appendix VI, A-G. The yield for the year was 3,104 kg. as against 7,209 kg. for 1934, and was only 72 kg. greater than in 1926. The number of fruit-bearing heads harvested was only just over half that recorded for 1934. The decrease in yield was shown equally by A, B and C groups.

In regard to FLOWERING, the number of female inflorescences at anthesis recorded during the year was 53 less than in 1934. There were the usual two waves of flowering with crests about May and November. The number of female inflorescences flowering in the first and second halves of 1934 were 540 and 562, but in 1935 the numbers were 294 and 795, respectively. This seems to indicate a return to more normal yields in 1936. In all years previous to 1934, rather more than half the annual total of female flowering occurred in the second half of the year.

There was a further decrease in the number of male inflorescences flowering, the number recorded during the year being 385 less than in 1934. This difference is no greater than has been regularly recorded between any one year and the previous year. Conditions which affected the production of female inflorescences do not appear to have affected at all the production of male. As usual, June was the lowest month for male flowering, but, contrary to normal, there were also fewer male than female inflorescences at anthesis in August and September this year. As in previous years, there was one annual wave of male flowering.

The average output of fruit of B palms was about 1.3 times that of A : a somewhat smaller difference than in previous years. As usual, the proportion of fruit per head for thin-shelled was less than for thick-shelled.

The highest yielding A palm in 1935 gave 60 kg. of fruit as against 54 kg. for the highest yielding B. As usual there was a higher proportion of higher yielding B than A palms although the majority of palms of both groups gave similar yields. This year the majority of palms gave yields between 0 and 15 kg. of fruit (38% gave between 5 and 10 kg.) as against 10-30 kg. in 1934. In regard to total yield of fruit for the ten years 1926-35, the highest yielding A palm has given 383 kg. as against 412 kg. for the highest yielding B.

The figures for the yield of the NATIVE PALMS are given in Appendix VI, H-K. The yields of Kawei, Henoi and Kpolei palms were 70%, 103 % and 42%, respectively, of the 1934 yields. About the same number of Kawei and Henoi palms bore fruits as in 1934, but only 55 Kpolei palms fruited in 1935 as against 68 last year. The majority of the palms of all three kinds yielded between 0 and 15 kg. of fruit during the year, while the highest yielding palms in 1935 gave : Kawei, 48 kg. ; Henoi, 29 kg. ; Kpolei 36 kg.

The figures for the yield of the ANGOLA PALMS are given in Appendix VI, L. The total yield was 27 kg. less than in 1934, the decrease being entirely due to the low yield of the two palms bearing thick-shelled fruit. The six palms gave the following yields of fruit :—

Palms bearing thick-shelled fruit, 24.5 and 20 kg.

Palms bearing thin-shelled fruit, 39, 33, 29 and 20 kg.

The figures for the yield of the DELI PALMS are given in Appendix VI, M. The yield was only 61% of the 1934 yield, and only 44 palms bore as against 71 in 1934. The majority of the palms gave between 0 and 10 kg. each, the highest individual yield being 30 kg.

The average weight of head and of fruit per head for the native, Angola and Deli palms is given in Appendix VI, N. The relation between the figures for the different kinds of palm is about the same as before, and heads have in all cases been larger than in previous years. The Angola palms still give the largest heads and are the youngest palms, except for the Deli which have given larger heads than any other palms at the same age.

BREEDING WORK for the purpose of selection of high yielding palms was begun in October, using the best Angola palms as parents. The best Angola palm has yielded an average of 96 lb. of fruit per annum during the last four years. Breeding from the Nigerian palms was discontinued on account of the relatively poor yields : the thin-shelled type shows no advantage over the Angola.

F. C. DEIGHTON,  
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## A—NIGERIAN OIL-PALMS, NJALA, 1935.

|               | YIELD OF A.                                            |                               |                         |                         | YIELD OF B.                                            |                               |                         |                         | YIELD OF C.                                            |                               |                         |                         | YIELD OF D.                                            |                               |                         |                         |
|---------------|--------------------------------------------------------|-------------------------------|-------------------------|-------------------------|--------------------------------------------------------|-------------------------------|-------------------------|-------------------------|--------------------------------------------------------|-------------------------------|-------------------------|-------------------------|--------------------------------------------------------|-------------------------------|-------------------------|-------------------------|
|               | Number of trees<br>from which heads<br>were harvested. | Number of heads<br>harvested. | Weight of heads,<br>kg. | Weight of fruit,<br>kg. | Number of trees<br>from which heads<br>were harvested. | Number of heads<br>harvested. | Weight of heads,<br>kg. | Weight of fruit,<br>kg. | Number of trees<br>from which heads<br>were harvested. | Number of heads<br>harvested. | Weight of heads,<br>kg. | Weight of fruit,<br>kg. | Number of trees<br>from which heads<br>were harvested. | Number of heads<br>harvested. | Weight of heads,<br>kg. | Weight of fruit,<br>kg. |
| January ...   | 9                                                      | 9                             | 79.4                    | 50.6                    | 9                                                      | 13                            | 140.2                   | 89.1                    | 1                                                      | 1                             | 6.6                     | 3.7                     | 1                                                      | 1                             | 8.6                     | 5.9                     |
| February ...  | 13                                                     | 15                            | 121.3                   | 74.4                    | 19                                                     | 20                            | 189.1                   | 117.4                   | —                                                      | —                             | —                       | —                       | —                                                      | —                             | —                       | —                       |
| March ...     | 34                                                     | 45                            | 305.0                   | 170.8                   | 34                                                     | 49                            | 450.7                   | 294.9                   | 2                                                      | 5                             | 23.9                    | 14.7                    | —                                                      | —                             | —                       | —                       |
| April ...     | 44                                                     | 60                            | 379.4                   | 207.5                   | 44                                                     | 54                            | 447.9                   | 287.9                   | 2                                                      | 3                             | 22.3                    | 13.1                    | 1                                                      | 1                             | 5.7                     | 3.9                     |
| May ...       | 49                                                     | 81                            | 506.2                   | 297.9                   | 44                                                     | 65                            | 459.6                   | 288.1                   | 7                                                      | 10                            | 86.6                    | 51.4                    | —                                                      | —                             | —                       | —                       |
| June ...      | 23                                                     | 30                            | 205.3                   | 115.2                   | 26                                                     | 32                            | 223.1                   | 131.7                   | 1                                                      | 1                             | 15.2                    | 9.9                     | —                                                      | —                             | —                       | —                       |
| July ...      | 14                                                     | 21                            | 132.3                   | 76.8                    | 21                                                     | 27                            | 166.6                   | 99.8                    | 1                                                      | 1                             | 3.4                     | 2.0                     | —                                                      | —                             | —                       | —                       |
| August ...    | 15                                                     | 16                            | 85.6                    | 53.8                    | 16                                                     | 20                            | 117.0                   | 68.1                    | 2                                                      | 3                             | 14.0                    | 7.9                     | —                                                      | —                             | —                       | —                       |
| September ... | 13                                                     | 16                            | 78.6                    | 48.8                    | 25                                                     | 28                            | 195.2                   | 117.2                   | 1                                                      | 1                             | 2.6                     | 1.6                     | —                                                      | —                             | —                       | —                       |
| October ...   | 17                                                     | 21                            | 104.3                   | 61.6                    | 22                                                     | 25                            | 181.0                   | 114.3                   | 1                                                      | 1                             | 3.7                     | 2.0                     | —                                                      | —                             | —                       | —                       |
| November ...  | 17                                                     | 18                            | 102.0                   | 58.4                    | 16                                                     | 19                            | 189.1                   | 115.8                   | 1                                                      | 2                             | 13.9                    | 7.9                     | —                                                      | —                             | —                       | —                       |
| December ...  | 6                                                      | 6                             | 30.9                    | 18.1                    | 2                                                      | 3                             | 28.9                    | 21.8                    | —                                                      | —                             | —                       | —                       | —                                                      | —                             | —                       | —                       |
| Total         | 129                                                    | 338                           | 2,130.3                 | 1,233.9                 | 141                                                    | 355                           | 2,788.4                 | 1,746.1                 | 13                                                     | 28                            | 192.2                   | 114.2                   | 2                                                      | 2                             | 14.3                    | 9.8                     |

**Appendix VI—continued.**  
*B—NIGERIAN OIL-PALMS, NJALA, 1935.*

**YIELD OF WHOLE PLANTATION.**

|           |     | Number of trees<br>from which heads<br>were harvested. |     |     | Number of heads harvested. |    |       | Weight of good<br>heads harvested,<br>kg. |     | Weight of fruit,<br>kg. |       |
|-----------|-----|--------------------------------------------------------|-----|-----|----------------------------|----|-------|-------------------------------------------|-----|-------------------------|-------|
|           |     |                                                        |     |     |                            |    |       |                                           |     |                         |       |
| January   | ... | ...                                                    | 20  | 24  | +                          | 19 | blind | =                                         | 43  |                         | 149   |
| February  | ... | ...                                                    | 32  | 35  | +                          | 9  | "     | =                                         | 44  |                         | 192   |
| March     | ... | ...                                                    | 70  | 99  | +                          | 0  | "     | =                                         | 99  |                         | 480   |
| April     | ... | ...                                                    | 91  | 118 | +                          | 9  | "     | =                                         | 127 |                         | 512   |
| May       | ... | ...                                                    | 100 | 156 | +                          | 8  | "     | =                                         | 164 |                         | 637   |
| June      | ... | ...                                                    | 50  | 63  | +                          | 6  | "     | =                                         | 69  |                         | 257   |
| July      | ... | ...                                                    | 36  | 49  | +                          | 5  | "     | =                                         | 54  |                         | 179   |
| August    | ... | ...                                                    | 33  | 39  | +                          | 11 | "     | =                                         | 50  |                         | 130   |
| September | ... | ...                                                    | 39  | 45  | +                          | 15 | "     | =                                         | 60  |                         | 168   |
| October   | ... | ...                                                    | 40  | 47  | +                          | 6  | "     | =                                         | 53  |                         | 178   |
| November  | ... | ...                                                    | 34  | 39  | +                          | 2  | "     | =                                         | 41  |                         | 182   |
| December  | ... | ...                                                    | 8   | 9   | +                          | 9  | "     | =                                         | 18  |                         | 40    |
| Total     | ... | ...                                                    | 284 | 723 | +                          | 99 | blind | =                                         | 822 | 5,125                   | 3,104 |

**Appendix VI—continued.**  
**C—NIGERIAN OIL-PALMS, NJALA, 1935.**

**ANALYSIS OF INDIVIDUAL TREE YIELD IN THE PLANTATION.**

| Yield in Kg.<br>of fruit. | Total number<br>of trees in the<br>plot bearing<br>in 1935. |      |       |       |       |       |       |       |       |       |       |       |
|---------------------------|-------------------------------------------------------------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
|                           | 0-5                                                         | 5-10 | 10-15 | 15-20 | 20-25 | 25-30 | 30-35 | 35-40 | 40-45 | 45-50 | 50-55 | 55-60 |
| A                         | ...                                                         | 30   | 51    | 31    | 11    | 3     | 1     | 1     | —     | —     | —     | 1     |
| B                         | ...                                                         | 18   | 51    | 30    | 19    | 16    | 2     | 2     | 1     | —     | 1     | —     |
| C                         | ...                                                         | 5    | 5     | 1     | —     | —     | 1     | —     | —     | —     | —     | —     |
| D                         | ...                                                         | —    | 1     | —     | —     | —     | —     | —     | —     | —     | —     | —     |
| Total (Whole<br>Plot)     | ...                                                         | 53   | 108   | 62    | 31    | 19    | 4     | 3     | 1     | —     | 1     | 1     |
| A                         | ...                                                         | 23.3 | 39.5  | 24.0  | 8.5   | 2.3   | 0.8   | 0.8   | —     | —     | —     | 0.8   |
| B                         | ...                                                         | 12.8 | 36.2  | 21.3  | 13.5  | 11.3  | 1.4   | 1.4   | 0.7   | —     | 0.7   | —     |
| Whole<br>Plantation       | ...                                                         | 18.7 | 38.0  | 21.8  | 10.9  | 6.7   | 1.4   | 1.1   | 0.4   | —     | 0.4   | 0.4   |



## Appendix VI—continued.

E—NIGERIAN OIL-PALMS, NJALA, 1935.

|            |            |     |     | Average<br>weight, heads<br>kg. | Average weight<br>fruit per head<br>kg. | Percentage<br>fruit in<br>head. |
|------------|------------|-----|-----|---------------------------------|-----------------------------------------|---------------------------------|
| January—   | A          | ... | ... | 8.8                             | 5.6                                     | 64                              |
|            | B          | ... | ... | 10.8                            | 6.9                                     | 64                              |
|            | Whole plot | ... | ... | 9.8                             | 6.2                                     | 63                              |
| February—  | A          | ... | ... | 8.1                             | 5.0                                     | 61                              |
|            | B          | ... | ... | 9.5                             | 5.9                                     | 62                              |
|            | Whole plot | ... | ... | 8.9                             | 5.5                                     | 62                              |
| March—     | A          | ... | ... | 6.8                             | 3.8                                     | 56                              |
|            | B          | ... | ... | 9.2                             | 6.0                                     | 65                              |
|            | Whole plot | ... | ... | 7.9                             | 4.8                                     | 62                              |
| April—     | A          | ... | ... | 6.3                             | 3.5                                     | 55                              |
|            | B          | ... | ... | 8.3                             | 5.3                                     | 64                              |
|            | Whole plot | ... | ... | 7.2                             | 4.3                                     | 60                              |
| May—       | A          | ... | ... | 6.2                             | 3.7                                     | 59                              |
|            | B          | ... | ... | 7.1                             | 4.4                                     | 63                              |
|            | Whole plot | ... | ... | 6.7                             | 4.1                                     | 61                              |
| June—      | A          | ... | ... | 6.8                             | 3.8                                     | 56                              |
|            | B          | ... | ... | 7.0                             | 4.1                                     | 59                              |
|            | Whole plot | ... | ... | 7.0                             | 4.1                                     | 58                              |
| July—      | A          | ... | ... | 6.3                             | 3.7                                     | 58                              |
|            | B          | ... | ... | 6.2                             | 3.7                                     | 60                              |
|            | Whole plot | ... | ... | 6.2                             | 3.7                                     | 59                              |
| August—    | A          | ... | ... | 5.4                             | 3.4                                     | 63                              |
|            | B          | ... | ... | 5.8                             | 3.4                                     | 58                              |
|            | Whole plot | ... | ... | 5.6                             | 3.3                                     | 60                              |
| September— | A          | ... | ... | 4.9                             | 3.0                                     | 62                              |
|            | B          | ... | ... | 7.0                             | 4.2                                     | 60                              |
|            | Whole plot | ... | ... | 6.1                             | 3.7                                     | 61                              |
| October—   | A          | ... | ... | 5.0                             | 2.9                                     | 59                              |
|            | B          | ... | ... | 7.2                             | 4.6                                     | 68                              |
|            | Whole plot | ... | ... | 6.1                             | 3.8                                     | 62                              |
| November—  | A          | ... | ... | 5.7                             | 3.2                                     | 57                              |
|            | B          | ... | ... | 10.0                            | 6.1                                     | 61                              |
|            | Whole plot | ... | ... | 7.8                             | 4.7                                     | 60                              |
| December—  | A          | ... | ... | 5.1                             | 3.0                                     | 59                              |
|            | B          | ... | ... | 9.6                             | 7.3                                     | 75                              |
|            | Whole plot | ... | ... | 6.7                             | 4.4                                     | 67                              |
| The year A | ...        | ... | ... | 6.3                             | 3.7                                     | 58                              |
|            | B          | ... | ... | 7.9                             | 4.9                                     | 63                              |
|            | Whole plot | ... | ... | 7.1                             | 4.3                                     | 61                              |

**Appendix VI—continued.**  
**F—NIGERIAN OIL-PALMS, NJALA, 1935.**

|                |     | AVERAGE YIELD OF FRUIT<br>PER TREE.               |                                                   | AVERAGE YIELD OF<br>FRUIT PER ACRE<br>(at 75 trees). |          |
|----------------|-----|---------------------------------------------------|---------------------------------------------------|------------------------------------------------------|----------|
|                |     | A<br>(Number of<br>trees fruiting,<br>129)<br>kg. | B<br>(Number of<br>trees fruiting,<br>141)<br>kg. | A<br>kg.                                             | B<br>kg. |
| January ...    | ... | 0.4                                               | 0.6                                               | 29                                                   | 47       |
| February ...   | ... | 0.6                                               | 0.8                                               | 43                                                   | 62       |
| March ...      | ... | 1.3                                               | 2.1                                               | 99                                                   | 157      |
| April ...      | ... | 1.6                                               | 2.0                                               | 121                                                  | 153      |
| May ...        | ... | 2.3                                               | 2.0                                               | 173                                                  | 153      |
| June ...       | ... | 0.9                                               | 0.9                                               | 67                                                   | 70       |
| July ...       | ... | 0.6                                               | 0.7                                               | 45                                                   | 53       |
| August ...     | ... | 0.4                                               | 0.5                                               | 31                                                   | 36       |
| September ...  | ... | 0.4                                               | 0.8                                               | 28                                                   | 62       |
| October ...    | ... | 0.5                                               | 0.8                                               | 36                                                   | 61       |
| November ...   | ... | 0.5                                               | 0.8                                               | 34                                                   | 62       |
| December ...   | ... | 0.1                                               | 0.2                                               | 11                                                   | 12       |
| Whole year ... | ... | 9.6                                               | 12.4                                              | 715                                                  | 928      |

Average yield over all of fruit per fruiting tree, 10.9 kg. (Number of trees fruiting, 284.)

Average yield over all of fruit per acre (at 75 trees), 820 kg.

Appendix VI—*continued*.

G—NIGERIAN OIL-PALMS, NJALA, 1935.  
 MALE AND FEMALE INFLORESCENCES AT ANTHESIS IN  
 DIFFERENT MONTHS.

|                    |     | Number of male<br>inflorescences<br>at anthesis. | Number of<br>female inflor-<br>escences at<br>anthesis. | Ratio of male<br>to female<br>inflorescences<br>at anthesis. |
|--------------------|-----|--------------------------------------------------|---------------------------------------------------------|--------------------------------------------------------------|
| January ...        | ... | 547                                              | 39                                                      | 14·0                                                         |
| February ...       | ... | 242                                              | 28                                                      | 8·6                                                          |
| March ...          | ... | 293                                              | 36                                                      | 8·1                                                          |
| April ...          | ... | 86                                               | 48                                                      | 1·8                                                          |
| May ...            | ... | 140                                              | 82                                                      | 1·7                                                          |
| June ...           | ... | 0                                                | 61                                                      | 0·0                                                          |
| July ...           | ... | 37                                               | 20                                                      | 1·8                                                          |
| August ...         | ... | 15                                               | 31                                                      | 0·5                                                          |
| September ...      | ... | 58                                               | 82                                                      | 0·7                                                          |
| October ...        | ... | 480                                              | 195                                                     | 2·5                                                          |
| November ...       | ... | 543                                              | 268                                                     | 2·0                                                          |
| December ...       | ... | 555                                              | 159                                                     | 3·5                                                          |
| Total for the year |     | 2,996                                            | 1,049                                                   | 2·9                                                          |

## Appendix VI—continued.

H—KAWEI OIL-PALMS, NJALA, 1935.

(161 trees in their 11th year after planting.)

|           | Number of trees from which heads were harvested. | Number of heads harvested. |         | Weight of good heads harvested, kg. | Weight of fruit kg. | Number of male inflorescences at anthesis. | Number of female inflorescences at anthesis. | Ratio of male to female inflorescences at anthesis. |
|-----------|--------------------------------------------------|----------------------------|---------|-------------------------------------|---------------------|--------------------------------------------|----------------------------------------------|-----------------------------------------------------|
| January   | 5                                                | 10                         | 1 blind | 35.4                                | 21.5                | 107                                        | 95                                           | 1.1                                                 |
| February  | 14                                               | 30                         | +       | 101.7                               | 66.3                | 67                                         | 46                                           | 1.5                                                 |
| March     | 32                                               | 72                         | +       | 221.7                               | 135.9               | 78                                         | 35                                           | 2.2                                                 |
| April     | 52                                               | 112                        | +       | 445.9                               | 298.9               | 29                                         | 23                                           | 1.3                                                 |
| May       | 78                                               | 149                        | +       | 682.4                               | 442.7               | 26                                         | 24                                           | 1.1                                                 |
| June      | 68                                               | 129                        | +       | 508.4                               | 310.9               | 10                                         | 7                                            | 1.4                                                 |
| July      | 59                                               | 89                         | +       | 293.0                               | 177.5               | 0                                          | 5                                            | 0.0                                                 |
| August    | 38                                               | 56                         | +       | 124.8                               | 71.9                | 4                                          | 5                                            | 0.8                                                 |
| September | 14                                               | 15                         | +       | 33.5                                | 20.8                | 166                                        | 29                                           | 5.7                                                 |
| October   | 9                                                | 10                         | +       | 24.5                                | 15.4                | 557                                        | 84                                           | 6.6                                                 |
| November  | 3                                                | 3                          | +       | 9.8                                 | 6.3                 | 477                                        | 48                                           | 9.9                                                 |
| December  | —                                                | 0                          | +       | —                                   | —                   | 343                                        | 34                                           | 10.1                                                |
| Total     | 144                                              | 675                        | +       | 2,481.1                             | 1,568.1             | 1,864                                      | 435                                          | 4.3                                                 |

Average yield of fruit per bearing tree, 10.9 kg.

# Appendix VI—continued.

J—HENOI OIL-PALMS, N.J.A.L.A, 1935.

(104 trees in their 11th year after planting.)

|           | Number of trees from which heads were harvested. | Number of heads harvested |   |          | Weight of good heads harvested, kg. | Weight of fruit, kg. | Number of male inflorescences at anthesis. | Number of female inflorescences at anthesis | Ratio of male to female inflorescences at anthesis. |
|-----------|--------------------------------------------------|---------------------------|---|----------|-------------------------------------|----------------------|--------------------------------------------|---------------------------------------------|-----------------------------------------------------|
| January   | 11                                               | 20                        | + | 12 blind | 44.4                                | 25.3                 | 5                                          | 50                                          | 0.1                                                 |
| February  | 21                                               | 56                        | + | 5 "      | 148.8                               | 90.3                 | 4                                          | 22                                          | 0.2                                                 |
| March     | 35                                               | 77                        | + | 0 "      | 213.7                               | 124.4                | 0                                          | 6                                           | 0.0                                                 |
| April     | 53                                               | 121                       | + | 14 "     | 347.8                               | 203.7                | 7                                          | 10                                          | 0.7                                                 |
| May       | 60                                               | 138                       | + | 7 "      | 400.7                               | 234.6                | 10                                         | 21                                          | 0.5                                                 |
| June      | 44                                               | 92                        | + | 2 "      | 285.6                               | 165.1                | 3                                          | 6                                           | 0.5                                                 |
| July      | 26                                               | 48                        | + | 5 "      | 131.7                               | 78.7                 | 5                                          | 2                                           | 2.5                                                 |
| August    | 7                                                | 10                        | + | 0 "      | 19.3                                | 10.9                 | 16                                         | 6                                           | 2.7                                                 |
| September | 5                                                | 6                         | + | 0 "      | 10.7                                | 6.0                  | 59                                         | 36                                          | 1.7                                                 |
| October   | 9                                                | 15                        | + | 0 "      | 43.7                                | 26.0                 | 288                                        | 83                                          | 3.5                                                 |
| November  | 8                                                | 13                        | + | 0 "      | 29.6                                | 18.1                 | 177                                        | 110                                         | 1.6                                                 |
| December  | 2                                                | 2                         | + | 1 "      | 2.8                                 | 1.5                  | 75                                         | 57                                          | 1.3                                                 |
| Total     | 89                                               | 598                       | + | 46 blind | 1,678.8                             | 984.6                | 649                                        | 409                                         | 1.6                                                 |

Average yield of fruit per bearing tree, 11.1 kg.

## Appendix VI—continued.

## K—KPOLEI OIL-PALMS, NJALA, 1935.

(74 trees, in their 10th year after planting.)

|           | Number of trees from which heads were harvested. | Number of heads harvested. | Weight of good heads harvested, kg | Weight of fruit, kg | Number of male inflorescences at anthesis. | Number of female inflorescences at anthesis. | Ratio of male to female inflorescences at anthesis. |
|-----------|--------------------------------------------------|----------------------------|------------------------------------|---------------------|--------------------------------------------|----------------------------------------------|-----------------------------------------------------|
| January   | 2                                                | 2 + 0 blind                | 9.4                                | 5.7                 | 62                                         | 7                                            | 8.9                                                 |
| February  | 11                                               | 18 + 0 "                   | 107.3                              | 67.8                | 25                                         | 11                                           | 2.3                                                 |
| March     | 15                                               | 24 + 0 "                   | 130.2                              | 76.2                | 6                                          | 6                                            | 1.0                                                 |
| April     | 22                                               | 45 + 0 "                   | 251.6                              | 159.7               | 7                                          | 2                                            | 3.5                                                 |
| May       | 19                                               | 42 + 0 "                   | 222.9                              | 150.9               | 7                                          | 0                                            | —                                                   |
| June      | 10                                               | 15 + 0 "                   | 83.1                               | 52.3                | 0                                          | 3                                            | 0.0                                                 |
| July      | 5                                                | 7 + 0 "                    | 27.5                               | 16.0                | 1                                          | 3                                            | 0.3                                                 |
| August    | 5                                                | 7 + 1 "                    | 21.7                               | 13.6                | 2                                          | 1                                            | 2.0                                                 |
| September | 4                                                | 4 + 0 "                    | 20.4                               | 12.8                | 21                                         | 33                                           | 0.6                                                 |
| October   | 2                                                | 3 + 0 "                    | 22.2                               | 14.6                | 146                                        | 137                                          | 1.1                                                 |
| November  | 2                                                | 2 + 0 "                    | 17.1                               | 11.9                | 191                                        | 60                                           | 3.2                                                 |
| December  | 2                                                | 2 + 0 "                    | 15.9                               | 10.6                | 126                                        | 16                                           | 7.9                                                 |
| Total     | 55                                               | 171 + 1 blind = 172        | 929.3                              | 592.1               | 594                                        | 279                                          | 2.1                                                 |

Average yield of fruit per bearing tree, 10.8 kg.

**Appendix VI—continued.**  
**L—ANGOLA OIL-PALMS, NJALA, 1935.**

(6 trees in their 9th year after planting.)

|           | Number of trees<br>from which heads<br>were harvested. | Number of heads<br>harvested. | Weight of<br>good heads<br>harvested.<br>kg. | Weight of<br>fruit,<br>kg. | Number of<br>male in-<br>florescences<br>at anthesis. | Number of<br>female<br>inflorescences<br>at anthesis. | Ratio of male<br>to female<br>inflorescences<br>at anthesis. |
|-----------|--------------------------------------------------------|-------------------------------|----------------------------------------------|----------------------------|-------------------------------------------------------|-------------------------------------------------------|--------------------------------------------------------------|
| January   | 2                                                      | 2                             | 13.2                                         | 6.9                        | 8                                                     | 3                                                     | 2.7                                                          |
| February  | 3                                                      | 4 + 0                         | 24.6                                         | 14.7                       | 3                                                     | 6                                                     | 0.5                                                          |
| March     | 3                                                      | 7 + 0                         | 43.7                                         | 25.8                       | 5                                                     | 3                                                     | 1.7                                                          |
| April     | 5                                                      | 12 + 0                        | 81.6                                         | 46.7                       | 0                                                     | 3                                                     | 0.0                                                          |
| May       | 2                                                      | 3 + 0                         | 21.8                                         | 13.4                       | 2                                                     | 5                                                     | 0.4                                                          |
| June      | 1                                                      | 2 + 0                         | 7.0                                          | 4.3                        | 0                                                     | 0                                                     | 0.0                                                          |
| July      | 4                                                      | 7 + 3                         | 35.0                                         | 19.2                       | 0                                                     | 1                                                     | 0.0                                                          |
| August    | 2                                                      | 3 + 0                         | 20.7                                         | 13.2                       | 0                                                     | 0                                                     | 0.0                                                          |
| September | 2                                                      | 2 + 0                         | 14.0                                         | 8.9                        | 0                                                     | 2                                                     | 0.0                                                          |
| October   | 3                                                      | 3 + 1                         | 18.9                                         | 11.7                       | 8                                                     | 13                                                    | 0.6                                                          |
| November  | —                                                      | — + —                         | —                                            | —                          | 17                                                    | 4                                                     | 4.2                                                          |
| December  | —                                                      | — + —                         | —                                            | —                          | 16                                                    | 4                                                     | 4.0                                                          |
| Total     | 6                                                      | 45 + 4 blind =                | 280.5                                        | 164.8                      | 59                                                    | 44                                                    | 1.3                                                          |

Average yield of fruit per bearing tree, 27.5 kg.

# Appendix VI—continued.

M—DELI OIL-PALMS, NJALA, 1935.

(106 trees, in their 5th year after planting.)

|           | Number of trees from which heads were harvested. | Number of heads harvested. | Weight of good heads harvested, kg. | Weight of fruit, kg. | Number of male inflorescences at anthesis. | Number of female inflorescences at anthesis. | Ratio of male to female inflorescences at anthesis. |
|-----------|--------------------------------------------------|----------------------------|-------------------------------------|----------------------|--------------------------------------------|----------------------------------------------|-----------------------------------------------------|
| January   | —                                                | 1                          | —                                   | —                    | 167                                        | 17                                           | 9.8                                                 |
| February  | 1                                                | 1                          | 2.2                                 | 1.1                  | 64                                         | 15                                           | 4.3                                                 |
| March     | 5                                                | 20                         | 25.6                                | 15.4                 | 76                                         | 7                                            | 10.9                                                |
| April     | 16                                               | 16                         | 73.1                                | 49.2                 | 59                                         | 2                                            | 29.5                                                |
| May       | 11                                               | 12                         | 70.0                                | 46.4                 | 61                                         | 10                                           | 6.1                                                 |
| June      | 19                                               | 0                          | 146.1                               | 95.4                 | 38                                         | 1                                            | 38.0                                                |
| July      | 17                                               | 7                          | 107.2                               | 65.2                 | 7                                          | 2                                            | 2.1                                                 |
| August    | 8                                                | 7                          | 27.7                                | 16.2                 | 2                                          | 3                                            | 0.7                                                 |
| September | 6                                                | 1                          | 25.3                                | 17.0                 | 42                                         | 6                                            | 7.0                                                 |
| October   | 7                                                | 1                          | 34.8                                | 21.8                 | 331                                        | 16                                           | 20.7                                                |
| November  | 3                                                | 2                          | 19.8                                | 13.0                 | 307                                        | 3                                            | 102.3                                               |
| December  | 2                                                | 0                          | 10.6                                | 7.4                  | 358                                        | 5                                            | 71.6                                                |
| Total     | 44                                               | 123 + 67 blind = 190       | 542.4                               | 348.1                | 1,512                                      | 87                                           | 17.4                                                |

Average yield of fruit per bearing tree, 7.9 kg.

# Appendix VI—continued.

N—NATIVE, ANGOLA, AND DELI OIL-PALMS, NJALA, 1935.

|                | Average weight, head, kg. |        |         |         | Average weight, fruit per head, kg. |        |        |         |         |       |
|----------------|---------------------------|--------|---------|---------|-------------------------------------|--------|--------|---------|---------|-------|
|                | Kawei.                    | Henoi. | Kpolei. | Angola. | Deli.                               | Kawei. | Henoi. | Kpolei. | Angola. | Deli. |
| January ...    | 3.5                       | 2.2    | 4.7     | 6.6     | —                                   | 2.1    | 1.3    | 2.8     | 3.4     | —     |
| February ...   | 3.4                       | 2.7    | 6.0     | 6.1     | 2.2                                 | 2.2    | 1.6    | 3.8     | 3.7     | 1.1   |
| March ...      | 3.1                       | 2.8    | 5.4     | 6.3     | 3.7                                 | 1.9    | 1.6    | 3.2     | 3.7     | 2.2   |
| April ...      | 4.0                       | 2.9    | 5.6     | 6.8     | 7.3                                 | 2.7    | 1.7    | 3.6     | 3.9     | 4.9   |
| May ...        | 4.6                       | 2.9    | 5.3     | 7.3     | 5.0                                 | 3.0    | 1.7    | 3.6     | 4.5     | 3.3   |
| June ...       | 3.9                       | 3.0    | 5.5     | 3.5     | 4.6                                 | 2.4    | 1.7    | 3.5     | 2.1     | 3.0   |
| July ...       | 3.3                       | 2.7    | 3.9     | 5.0     | 3.7                                 | 2.0    | 1.6    | 2.3     | 2.7     | 2.2   |
| August ...     | 2.2                       | 1.9    | 3.1     | 6.9     | 2.5                                 | 1.3    | 1.1    | 1.9     | 4.4     | 1.5   |
| September ...  | 2.2                       | 1.8    | 5.1     | 7.0     | 4.2                                 | 1.4    | 1.0    | 3.2     | 4.4     | 2.8   |
| October ...    | 2.4                       | 2.9    | 7.4     | 6.3     | 4.3                                 | 1.5    | 1.7    | 4.9     | 3.9     | 2.7   |
| November ...   | 3.3                       | 2.3    | 8.5     | —       | 6.6                                 | 2.1    | 1.1    | 5.9     | —       | 4.3   |
| December ...   | —                         | 1.4    | 7.9     | —       | 5.3                                 | —      | 0.7    | 5.3     | —       | 3.7   |
| Whole year ... | 3.7                       | 2.8    | 5.4     | 6.2     | 4.5                                 | 2.3    | 1.5    | 3.5     | 3.7     | 2.8   |

## Appendix VII.

### DISTRIBUTION OF PLANTING MATERIAL, 1935.

|                                    |    |    | Northern<br>Province. | Southern<br>Province. | Colony. |
|------------------------------------|----|----|-----------------------|-----------------------|---------|
| Avocado                            | .. | .. | —                     | 28                    | —       |
| Banana, Canary (sucker)            | .. | .. | 1,180                 | —                     | 867     |
| Breadfruit                         | .. | .. | —                     | 56                    | —       |
| Breadnut                           | .. | .. | —                     | 6                     | —       |
| Bengal bean, seed, lb.             | .. | .. | —                     | 850                   | —       |
| Calopogonium muconoides, seed, lb. | .. | .. | —                     | 120                   | —       |
| Cantaloupe melon, seed packet      | .. | .. | —                     | 2                     | —       |
| Cassava, Mayugbe, sticks (bundles) | .. | .. | 55                    | 59                    | —       |
| "    White                         | .. | .. | —                     | 1                     | —       |
| "    Two Cent                      | .. | .. | 13                    | 61½                   | —       |
| "    Kono                          | .. | .. | —                     | 1                     | —       |
| Cashew nut, seed, lb.              | .. | .. | —                     | 3                     | —       |
| "    seedlings                     | .. | .. | —                     | 24                    | —       |
| Cinnamon                           | .. | .. | —                     | 31                    | —       |
| Coffee, Robusta, seed, lb.         | .. | .. | 90                    | 58½                   | —       |
| "    "    seedlings                | .. | .. | 2,669                 | 1,028                 | 706     |
| "    Stenophylla, seed, lb.        | .. | .. | —                     | 20                    | —       |
| "    "    seedlings                | .. | .. | —                     | —                     | 262     |
| Coco yam, crowns, lb.              | .. | .. | 103                   | —                     | —       |
| Cowpea, seed, lb.                  | .. | .. | —                     | 1                     | —       |
| Efwatakala grass, seed, lb.        | .. | .. | —                     | 5                     | —       |
| Garden eggs, seed, packet          | .. | .. | —                     | 3                     | —       |
| Ginger, lb.                        | .. | .. | 80                    | 7,780                 | —       |
| Grapefruit                         | .. | .. | —                     | —                     | 502     |
| Ground-nut, Kono, lb.              | .. | .. | 300                   | 191                   | —       |
| Jakfruit, seed, packet             | .. | .. | —                     | 3                     | —       |
| "    seedlings                     | .. | .. | —                     | 33                    | —       |
| Kola                               | .. | .. | —                     | 30                    | —       |
| Lemon                              | .. | .. | —                     | —                     | 68      |
| Lettuce, seed, packet              | .. | .. | —                     | 1                     | —       |
| Lime                               | .. | .. | —                     | —                     | 544     |
| Maize, lb.                         | .. | .. | —                     | 6                     | —       |
| Oil-palm, Deli, seed, lb.          | .. | .. | —                     | 86                    | —       |
| "    "    Seedlings                | .. | .. | 867                   | 63                    | —       |
| "    Nigerian, seed, lb.           | .. | .. | —                     | 15                    | —       |
| "    "    seedlings                | .. | .. | —                     | 114                   | 120     |
| Oranges, seedlings                 | .. | .. | —                     | —                     | 194     |
| Pawpaw, seed, packet               | .. | .. | —                     | 17                    | —       |
| "    seedlings                     | .. | .. | —                     | 19                    | —       |
| Plum, Governor                     | .. | .. | —                     | 31                    | —       |
| Pine-apple, Red Spanish            | .. | .. | —                     | —                     | 118     |
| "    Queen                         | .. | .. | —                     | —                     | 6       |
| "    Smooth Cayenne                | .. | .. | —                     | —                     | 6       |
| Pueraria sp., seed, lb.            | .. | .. | —                     | 72                    | —       |
| Rice, Indo-China (bushel)          | .. | .. | —                     | 1                     | —       |
| "    G.E.B. 24                     | .. | .. | 102                   | —                     | 2       |
| "    Fodea                         | .. | .. | —                     | —                     | 48      |
| "    D.C. swamp                    | .. | .. | —                     | —                     | 76      |
| "    "    Upland                   | .. | .. | 165                   | —                     | 21      |

Appendix VII—*continued*.

## DISTRIBUTION OF PLANTING MATERIAL, 1934.

|                           |    |    | Northern<br>Province. | Southern<br>Province. | Colony. |
|---------------------------|----|----|-----------------------|-----------------------|---------|
| Rice Toma                 | .. | .. | —                     | —                     | 20      |
| „ Miscellaneous Wet-land  | .. | —  | 187                   | —                     | —       |
| Rose apple                | .. | .. | —                     | 7                     | —       |
| Capodilla                 | .. | .. | —                     | 8                     | —       |
| Isal Bulbils              | .. | .. | —                     | 36                    | —       |
| our sop                   | .. | .. | —                     | 13                    | —       |
| Snake gourd, seed, packet | .. | .. | —                     | 2                     | —       |
| Gun Hemp, seed, lb.       | .. | .. | —                     | 12                    | —       |
| Sweet Lime                | .. | .. | —                     | 22                    | 4       |
| Sweet sop                 | .. | .. | —                     | 13                    | —       |
| Sword beans, lb.          | .. | .. | —                     | 141                   | —       |
| Angerine, seed, packet    | .. | .. | —                     | 4                     | 114     |
| Tomato, seed, packet      | .. | .. | —                     | 8                     | —       |
| Baba cane, sticks         | .. | .. | —                     | 10                    | —       |
| Yams, Chinese, lb.        | .. | .. | 304                   | 1,032                 | —       |
| Yams, Jaffna, lb.         | .. | .. | 60                    | —                     | —       |
| „ White, lb. ..           | .. | .. | 295                   | —                     | —       |
| „ Yellow, lb. ..          | .. | .. | 2,117                 | 531                   | —       |

## Appendix VIIA.

### DISTRIBUTION OF PLANTING MATERIAL, 1935.

#### ORNAMENTAL PLANTS FROM NJALA AGRICULTURAL STATION.

|                                    |    |    |    |    |    |       |
|------------------------------------|----|----|----|----|----|-------|
| Acalypha, cuttings                 | .. | .. | .. | .. | .. | 150   |
| Allamanda "                        | .. | .. | .. | .. | .. | 68    |
| Angelica " ..                      | .. | .. | .. | .. | .. | 1,020 |
| Aristolochia, seeds, packet        | .. | .. | .. | .. | .. | 8     |
| Bauhinia, seeds, packet            | .. | .. | .. | .. | .. | 7     |
| " plants                           | .. | .. | .. | .. | .. | 6     |
| Bignonia magnifica                 | .. | .. | .. | .. | .. | 1     |
| " Unguis-cati                      | .. | .. | .. | .. | .. | 50    |
| Bougainvillea, cuttings            | .. | .. | .. | .. | .. | 114   |
| Cactus, Euphorbia                  | .. | .. | .. | .. | .. | 30    |
| Caladium bicolor                   | .. | .. | .. | .. | .. | 20    |
| Canna                              | .. | .. | .. | .. | .. | 12    |
| Cassia siamea, seeds, packet       | .. | .. | .. | .. | .. | 2     |
| " sieberiana, seeds, packet        | .. | .. | .. | .. | .. | 3     |
| Clerodendron fallax, seeds, packet | .. | .. | .. | .. | .. | 2     |
| " " plants                         | .. | .. | .. | .. | .. | 7     |
| " paniculatum                      | .. | .. | .. | .. | .. | 63    |
| Croton, cuttings                   | .. | .. | .. | .. | .. | 10    |
| Derris elliptica                   | .. | .. | .. | .. | .. | 24    |
| Dracæna, cuttings                  | .. | .. | .. | .. | .. | 30    |
| Duranta, cuttings                  | .. | .. | .. | .. | .. | 92    |
| Dhub grass (hampers)               | .. | .. | .. | .. | .. | 6     |
| Erythrina glauca, cuttings         | .. | .. | .. | .. | .. | 42    |
| Flamboyante, seeds packets         | .. | .. | .. | .. | .. | 6     |
| Gliricidia maculata, cuttings      | .. | .. | .. | .. | .. | 40    |
| Gmelina arborea                    | .. | .. | .. | .. | .. | 1     |
| " hystrix                          | .. | .. | .. | .. | .. | 2     |
| Hibiscus, cuttings                 | .. | .. | .. | .. | .. | 82    |
| Hydrangea                          | .. | .. | .. | .. | .. | 3     |
| Jacquemontia                       | .. | .. | .. | .. | .. | 11    |
| Ipomœa dissecta, seeds, packet     | .. | .. | .. | .. | .. | 4     |
| Ixora coccinea, cuttings           | .. | .. | .. | .. | .. | 16    |
| Ixora lutea, cuttings              | .. | .. | .. | .. | .. | 59    |
| Jasminum grandiflorum              | .. | .. | .. | .. | .. | 31    |
| Jatropha multifida                 | .. | .. | .. | .. | .. | 5     |
| " podagrica, seeds, packet         | .. | .. | .. | .. | .. | 6     |
| Lagerstroemea Flos-reginæ          | .. | .. | .. | .. | .. | 1     |
| " indica                           | .. | .. | .. | .. | .. | 4     |
| Leucæna glauca                     | .. | .. | .. | .. | .. | 24    |
| Mimosa rubricaulis                 | .. | .. | .. | .. | .. | 32    |
| Moon flower, seeds, packet         | .. | .. | .. | .. | .. | 4     |
| Morning Glory                      | .. | .. | .. | .. | .. | 28    |
| Oleander, cuttings                 | .. | .. | .. | .. | .. | 54    |
| Peltophorum africanum              | .. | .. | .. | .. | .. | 6     |
| Petrea volubilis, cuttings         | .. | .. | .. | .. | .. | 1     |
| Phyllanthus                        | .. | .. | .. | .. | .. | 1     |
| Pitanga Cherry                     | .. | .. | .. | .. | .. | 346   |
| Pithecolobium unguis-cati          | .. | .. | .. | .. | .. | 4     |
| Poinsettia, cuttings               | .. | .. | .. | .. | .. | 3     |

**Appendix VIIA—*continued*.**  
**DISTRIBUTION OF PLANTING MATERIAL, 1935.**

ORNAMENTAL PLANTS FROM NJALA AGRICULTURAL STATION.

|                             |    |    |    |    |    |    |
|-----------------------------|----|----|----|----|----|----|
| Quisqualis, cutting         | .. | .. | .. | .. | .. | 2  |
| Screw pine                  | .. | .. | .. | .. | .. | 15 |
| Solanum macranthum          | .. | .. | .. | .. | .. | 8  |
| Tecoma stans, seeds, packet | .. | .. | .. | .. | .. | 8  |
| Thevetia, cuttings          | .. | .. | .. | .. | .. | 58 |
| Thrinax argentea, seedlings | .. | .. | .. | .. | .. | 1  |
| Thunbergia laurifolia       | .. | .. | .. | .. | .. | 13 |
| Toddy palm                  | .. | .. | .. | .. | .. | 49 |









